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March 5, 1931

Field Studies of Reservoir Sites Made Rapidly

Toledo Sewage-Works Highly Mechanized

Abolition of Township Road Control Proposed

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Contents for March 5, 1931

VOLUME 106, NUMBER 10

Copyright, 1931, by McGraw-Hill Publishing Company, Inc.

Rapid Field Studies Made of Reservoir Sites..... 386
By J. ALBERT HOLMES

Toledo Sewage-Works Highly Mechanized..... 389
By HARVEY P. JONES

Abolition of Township Road Control Proposed..... 393

Basket-Weave Revetments on the Missouri..... 395
By F. Y. PARKER

Victoria Falls Bridge Altered Under Traffic..... 398

Connecticut River Diversion Approved..... 399

Current Concrete Investigations Discussed by A. C. I..... 402

Water-Supply Conditions in the Drought Regions..... 405

Editorial	383	Letters	407	News	409
Equipment	415	Business News	417	Material Prices	420
		Unit Prices	423		

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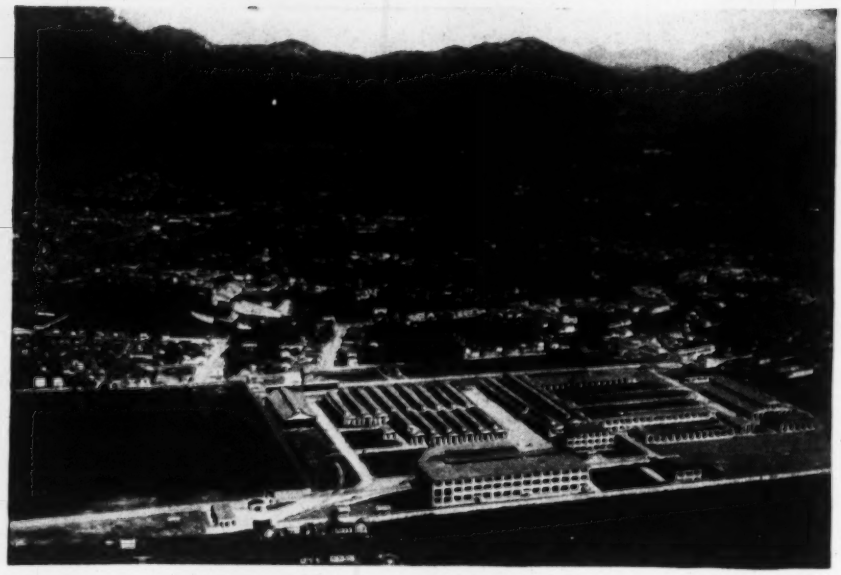

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F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, MARCH 5, 1931 Number 10

Edgar Jadwin

LIEUT. GEN. EDGAR JADWIN (retired), former Chief of Engineers, U. S. Army, is dead. Retirement from active service for General Jadwin meant retirement in name only; death came to him at Balboa in the Panama Canal Zone while serving as chairman of the Interoceanic Canal Board. He was also chairman of the reorganized Federal Power Commission and of the engineering board of the New York State St. Lawrence Power Development Commission, as well as consulting engineer to the Meadows Reclamation Commission of New Jersey. He was no nominal chairman or consultant; he took an active and aggressive part in each activity. Similar characteristics marked his handling of the development of the Mississippi flood-control plan. He knew what he wanted and set about getting it despite all opposition and contrary opinion. This journal was among those that opposed his methods in handling the Mississippi flood planning. That fact makes it imperative that we record here our high regard for some of the qualities displayed by General Jadwin. Too many engineers are content with what they can obtain without combating stiff opposition. A little more of General Jadwin's aggressiveness tempered by more tolerance would be welcome in many engineering undertakings.

Basket Woven Revetment

BRUSH revetment has no more attractive form than the basket woven mattress of willows commonly employed on the Missouri River and described in this issue. Skill of handwork, which is the notable feature of all brush revetment construction, is particularly evident in woven willow revetment. The process as described is one of simple detail, but, like basket weaving in the finer representations of Indian handiwork, strength and compactness of fabric lie in the craftsmanship of the weaver and not in a mere orderly rotation of processes. The basket mattress of the Missouri is more flexible than the framed and the fascine mattresses of the lower Mississippi; it is also thinner and weaker. It has one notable advantage in the fact that it can readily be thickened by weaving to it another layer of willows. With the two sturdier types used on the Mississippi it rounds out an admirable technique of brush-revetment construction developed by American river engineers.

Separate Sludge Digestion

THE sewage treatment plant now under construction at Toledo calls attention to a process that has been making rapid strides in the last few years. Separate digestion of sludge, as distinguished from digestion in the lower compartment of a two-story tank, can be traced back to studies made at the Lawrence experiment station in 1899. Although the process was definitely recommended for installation at Paterson, N. J., in 1906 by the late Allen Hazen, its first real application was at Birmingham, England, in 1912. Soon thereafter Baltimore, experiencing unsatisfactory operation of its Imhoff tank plant, added to the existing installation a number of tanks for the sole purpose of sludge digestion. Since that time a number of plants have been built in this country and abroad, mostly for the smaller cities. A great deal has been learned about sludge digestion since the time of the first installations. The value of gas collection and utilization in the control of temperature and the ease with which conditions most advantageous to digestion can be maintained in separate tanks will doubtless encourage the use of separate digestion more and more as time goes on.

Costly Experiment

THAT ancient political football, the Michigan state cement plant, has been again put into play. Press and politicians are now debating whether the present legislature should continue operation of the plant or sell it and send its operating crew back to the penitentiary. Brought into being as a part of former Governor Alexander J. Groesbeck's adventure into state socialism in highway construction, the plant has had an irregular producing career since 1925 and in that time, according to a statement of the state treasurer on July 1, 1930, had gone three-quarters of a million dollars "into the red." Now that state officials are ready to concede financial failure, it would appear that the state manufacture of cement in Michigan should be ultimately approaching its end. This would leave in operation only the state plant at Rapid City, S. D., which was born in 1923-24 of the Non-Partisan League movement and since then has earned $668,000 according to its advocates and has lost $412,000 according to its opponents. Government attempts to save money by going into manufacturing have turned out to be costly experiments.

Not by Subsidy

FALL RIVER, according to reports, is on the verge of bankruptcy—another illustration of the gravity of the modern city's financial and administrative difficulties. There is talk of a virtual receivership, with financial control of the city taken over by the legislature. Both a narrow debt limit and wasteful administration appear to be responsible for default on obligations and a threatened tax rate of 7c. per dollar. But while few cities ever reach the point of defaulting on interest payments there are many that suffer from high taxes and inadequate improvements. At the same time two demands are being currently made that do not better the situation: a widespread demand from real estate interests for reduction in taxes, and a demand by municipal officials that the state contribute money to the cities, chiefly from road funds. These conflicting forces make one point clear above all: that city progress depends on efficiency and economy of administration aided by care-

ful advance budgeting of improvement expenditures. Governor Roosevelt, of New York, within recent days warned the cities of his state that some of them might soon reach bankruptcy if they did not curtail their wasteful expenditures, and at the same time he cautioned them against looking for help from state funds, saying: "The danger of indirect taxation lies in its concealing what our money is being spent for. . . . Every year some ingenious plan is born by which some kind of a tax shall be collected by the state and distributed back to relieve the local tax budget. This is a wrong and vicious principle." His warning has far-reaching significance. The ills of municipal administration cannot be cured by subsidy.

County Road Reform

THE report on county highway administration by state officials of North Carolina and the Bureau of Public Roads, as summarized in this issue, is a revolutionary utterance. It urges the abolition of the township and the substitution of the county as the smallest highway administrative unit and implies quite frankly that there are now too many counties and that public-roads development would gain by somewhat liberal consolidation.

In general, the first conclusion is in harmony with much of the recent thinking of students of highway administration. It is not probable that the people generally would offer much opposition to, and indeed might widely favor, the assumption of township road improvement by the county. This would not destroy the political unit of the township. The case assumes a quite different aspect, however, if it is attempted to wipe out jealously regarded governmental boundaries by merging two or more counties. It is pertinent to inquire therefore what convincing evidence the North Carolina report presents.

The greater percentage of the wealth is in the smaller percentage of counties. Specifically, in North Carolina, three-quarters of the wealth is in forty of the hundred counties. Counties generally do not include areas of rich and poor development but are either rich or poor. The area and road mileage of the average county do not permit full use, and therefore economic use, of such equipment as modern road improvement requires. No question of these facts is possible. They are matters of common knowledge and observation and they are as true of every other state as they are of North Carolina. Will any practicable merger of counties change conditions? The North Carolina survey gives no evidence that it will except in isolated cases even if the rich county were willing to share with its poor neighbor.

The report merits more respectful consideration for its findings and conclusions on the deficiencies of county road management. Ignorance of county road departments as to the mileage of county roads, allocation of gasoline tax money to general county debt service, expenditure of road funds without regard to traffic importance, and waste through equipment idleness, all are matters with which highway officials and the road user need to concern themselves directly and immediately. In pointing out these conditions clearly by an indisputable array of factual statements, the North Carolina survey has added in large measure to the weapons for the fight to reform local road administration and has provided increased means for wise public-roads planning.

Connecticut Deversion Decision

FUNDAMENTALLY the decision of the United States Supreme Court on Feb. 24 in the Connecticut River diversion case is identical with the special master's findings in the Delaware River diversion case. Therefore, it having been decided that the Boston metropolitan district can divert water from the Connecticut, New York City may expect a similar decision as to the Delaware River. In findings of facts as to damage, and relief from it by cutting down diversion, the two cases are quite different, but it is unnecessary to go into that now.

Added to the irrigation cases decided some time ago, in which different customs and legislation as to diversion by one state of interstate waters flowing into another were upheld, and to the implications of the decision refusing to enjoin the Chicago Drainage District from diverting the waters of the Great Lakes to the Mississippi basin, the Connecticut diversion ruling establishes beyond question the equality of rights of two or more states to interstate waters, subject to equitable apportionment without irremediable or compensable damages.

The Connecticut and Delaware diversion cases are significant because all the states concerned recognize the doctrine of riparian rights, as contrasted with prior appropriations in the irrigation cases. Connecticut and New Jersey claimed that under the riparian law their sanction was necessary before another state could divert water common to both even from tributaries wholly within the boundaries of the diverting state. As the riparian doctrine holds in most of our states, containing a large majority of the urban population of the country, and as the irrigation decisions virtually covered the rest of the country, the law of interstate rights in interstate waters is now firmly established. It is true that in the cases thus far decided only the two highest uses to which water can be put—domestic supply and irrigation—were in direct issue, but the doctrines of equal rights to equitable apportionment seem to apply as fully to other uses; in fact, damages to almost every conceivable user or beneficiary of water were claimed by Connecticut and New Jersey as a ground for injunctive declaration that these states had supreme control of the diversion of interstate waters in which they were concerned. In the lakes diversion case, while the suit was based primarily on alleged damage to navigation, the object of the diversion was protection to a public water supply and aid in the disposal of sewage. The disposal of sewage and other industrial wastes was also brought into the Connecticut and Delaware river diversion cases by the states seeking injunctions.

Although the Connecticut decision points to an identical ruling of law in the Delaware case, it leaves open to conjecture the application by the court of the master's findings in the Delaware litigation. In the Connecticut case the master found no substantial damages except slight possible damage to a power plant, in case a projected enlargement should ever be made. The supreme court passes over the master's recommendation for conditional damages, holding that awards cannot be made for prospective damages. Although the master in the Delaware suit held damages in each individual element small, yet by lumping them together he felt justified in recommending to the supreme court a material cut in the total diversion to be allowed. Moreover, at least by implication, he advised just what tributaries of the Delaware should be eliminated from New York City's Delaware River project. Will the court go that far?

Both the Delaware and Connecticut river projects introduce new concepts or practices into American water takings for municipal supply—or present them on a more definite and comprehensive basis. In effect, both store flood flows up to set limits, and either refrain from drawing the stored water or else release it to maintain stipulated streamflows. Utilization of flood flows only seems to have been a Massachusetts conception, brought forward in the 1922 joint commission report, on which the present diversion is largely based.

Finally, the Connecticut decision and the Delaware master's recommendations clearly recognize that in matters of public water supply a city or district is entitled to wide latitude in choice among various possible supplies, giving weight to relative costs, and reliability in volume, and purity. Both New Jersey and Connecticut sought to prove that some other source than the one chosen would be as good and as cheap, if not better in both respects. Connecticut in particular urged the use of near-by sources, holding that if less pure by nature they could be made satisfactory by treatment. First the master, then the court, ruled against the applicability of such reasoning. Altogether, then, the freedom of cities to choose between a naturally pure and an artificial purified supply is increased by the Connecticut River decision, but above this in importance is the bearing of the decision upon interstate water conflicts, which hereafter will rest on equal rights of each state to its equitable part of the whole.

Forecast of Advance

NEW currents of strong interest are evidently stirring in the realm of concrete. Clear indication of such change appeared in the work of the American Concrete Institute meeting last week. It revealed an earnest inquiring attitude and vigorous purpose to search more deeply into the character and behavior of concrete.

Question is being raised about many well-accepted matters. The mechanics of mixing, the phenomena of colloidal action and of chemical heating and volume change, are under new scrutiny. There is doubt as to whether the interior condition of large concrete masses is sufficiently known. Plastic flow of concrete is being studied with more serious concern. Challenge is being directed at the solidly established doctrine of strength-proportioning of concrete, even to the extent of suggesting that strength has been made a fetish, and that density and durability should be put ahead of it. Concrete men are exhibiting a willingness to go back to fundamentals in the search for precise and substantial knowledge of how to make and use concrete most efficiently.

Probably the chastening influence of depressed business is partly responsible for the new interest and new thought; adversity is a good preceptor and does not tolerate the self-complacency of prosperous days. But quite aside from this effect, there is also the accumulating pressure of ignorance to consider. For some years the problems of concrete have been piling up faster than knowledge, and a number of recent situations, most sensationally the concrete problems of Hoover Dam, have laid emphasis on the fact that we know too little.

The present attitude of concrete workers and students forecasts significant advance in the art in the early future. There is ample ability in the army of investigators, and it is likely that means can be found for carrying through the extensive researches required. A new period in the history of concrete thus appears to be opening.

Guiding Principles and A Business Program

INDUSTRY and business have marked time for more than a year. It has been a sobering interval, intensely so. Old principles, long neglected, reasserted themselves—such principles as definite purpose, personal and business integrity, and thrift. But in addition some new guiding policies now claim recognition as aids in directing the rebuilding of our complex business activities.

New policies will not be effective until they are worked out by the joint thinking of the whole community—until individuals and organizations acknowledge them and put them to practical application. To give a starting point and furnish a safe guide for immediate use, the outline of a program for American business is offered in a supplement accompanying this issue of *Engineering News-Record*. It is submitted for the thoughtful consideration of the engineering profession and its allied industries. We have strong faith in its soundness and are convinced of its dominating importance to business reconstruction.

A word on the genesis of the program. Its original beginnings were certain conclusions formulated after thorough study of the present depression and its antecedent expansion period by Dr. Virgil Jordan, the widely known economist of *The Business Week*. Developed and elaborated in numerous conferences of technical and industrial experts of the McGraw-Hill Publishing Company, it was further refined by discussions with leading men of production, finance and commerce. As now presented it is fitted with great forethought to all foreseeable requirements of today's juncture and the evolution of productive activity to new vigor.

Here we may repeat in a word the four objectives underlying the program, whose basic importance is too evident to require justification. They are:

Maintain established standards of living.
Stabilize future business growth by long-term planning.
Promote international business cooperation.
Encourage private initiative and responsibility.

Nearly eight years of expansion, of speculative growth, were followed by deflation when the overstrained credit structure at last gave way. Supply and demand were thrown out of balance, and commodity prices sagged as the world stopped building and production had to be curtailed. Credit has now begun to readjust itself, and commodity prices are slowly trending back toward their former levels. Prospects are good for regaining soon the entire adjustment of production and consumption on which our eight-year prosperity rested. If no other factor of the complex equation is disturbed, such as wage rates, the forward evolution will proceed. For this reason the point of overshadowing importance, the basic item of business policy, is that all should stand together in maintaining and indeed further advancing the living standard on which our life is built.

First of all, then, we have the duty of reaching a very thorough understanding of the need for maintained living standards. This attained and the policy firmly established, we shall be ready to plan and build with confidence. To join in fixing this policy is as much the responsibility of engineer, of contractor, of manufacturer of the materials and tools of construction, of city and industrial official, as it is of a Taylor, a Ford or a Young.

Making Rapid Field Examinations of Flood-Control Reservoir Sites

Methods used to secure physical and economic data on fourteen dams and six river systems in the Mississippi valley — Work completed quickly despite difficulties

By J. ALBERT HOLMES
Hydraulic Engineer, New England Power Co., Boston, Mass.

ONE OF THE tasks which faced the Mississippi River commission in its flood-control study of the lower Mississippi valley was the determination of the effect of retention reservoirs on floods, both local and general. This required the assembly of data covering, for the region affected, population, amount of manufacturing, agriculture, navigation, irrigation and land drainage. It also necessitated a rapid field examination of dam and reservoir locations in order to estimate the suitability of available sites and the approximate costs of construction. Although conducted primarily for flood-control purposes, the study also touched incidentally upon the improvement of navigation, irrigation and drainage conditions.

Fig. 1—Field party and equipment

Time was the essence of all activities of the commission immediately following the enactment of enabling legislation. Especially was this true of the work pertaining to survey. In all, fourteen dam and reservoir sites were examined and reported upon in Arkansas and Mississippi, and six economic surveys made of rivers in Arkansas, Louisiana and Mississippi, during a period of 4½ months. This work involved nearly 7,000 miles of rail and auto travel and was complicated by the nature of the territory involved.

No geological survey topographical sheets exist for parts of Arkansas, and only meager and inaccurate district plans could be secured in place of base maps. Automobile road maps were made use of to reach distant points. These showed no roads other than state highways; all others were less than secondary. When approaching a river, or in river bottoms, these faded to wood roads, stump-dodging trails, or to no trail at all. In the case of the one location in Arkansas, the twistings of the river in the mountain gorges agreed not at all with the twists on the maps. When finally located, at the end of the third day's search, the site was not in the same county. In the meantime, a promising section of the valley that had been reached by auto down a rocky creek bed had been partly surveyed, a compass survey made of several river bends to identify the right one and most of the final survey completed, before it was certain the desired location had been found. Another mountain site was reached by traversing wood roads and trails to the site of an old fortified camp alleged to have been occupied by Jesse James in his horse-stealing days, and thence by tramping down the valley and toting equipment by foot trail. At still another site 50 miles of auto travel was required to gain a point less than 4 miles upstream from the starting point.

To reach a given point located on a map a pocket compass was used to determine direction and the automobile speedometer for distance. When the meter registered the distance scaled on a map to a cross road, or to where a turn was to be made opposite a river location, the turn was made. The distance and direction traveled became a part of the record, supplemented by foot travel measured by pedometer. To indicate the route leading to a site these data were plotted on the base map.

When a site had been reached its possibilities were studied, the most favorable and economic dam location fixed, and the type of structure (whether masonry, rockfill or earth) decided upon. The decision as to type was dictated by accessibility, availability of materials of construction, foundation conditions and probable use (as for flood control, power, or a combination of these and others). A transit and stadia survey was then made of the dam site, the survey plotted and the proposed dam sketched in sufficient detail (Fig. 3) to determine quantities and to indicate its type and the position of spillway, outlets, flood conduits and channels. The geology of the site was studied and the character, strike, dip and extent of rock outcrop and its suitability for foundation purposes and as a construction material determined. Field instruments used in studying the rocks were a pocket compass and a magnifying glass.

Drainage areas were determined and data on hydrology gathered from existing maps and from records of rainfall and runoff. These data were supplemented by river cross-sections and profiles made in the field, in which flood heights were obtained with the transit and stadia, and river cross-sections with the aid of an auto or by wading, with or without pants. (The latter method became annoying in November and December.) Other methods were to take sections at bridges, if there were any; by mules and a wagon, the mules swimming and the wagon floating; by boat when boats were to be had, which was not often; or by raft—not a good method in swift water. Broad rivers were crossed on stern-wheel

steamboats of ancient type and on wire controlled ferries, and smaller streams by cutting and felling a tree for a footbridge, or by a trough bridge of planks (Fig. 4). The trough bridge was approached through a steep cut in a high bank and required a steady and firm hand, a cool and calculating head and the greatest skill of an automobile driver. Should the narrow troughs be missed, there was nothing to stop against but the bottom of the river, and that a deep one, for trough bridges are not built at shallow fords.

Two earth and four rockfill dam sites were studied in Arkansas. The earth dams would be low structures in broad river bottoms having flat gradients and no rock exposures, except at the end of one of the dams. Materials for the construction for the earth dams, it was found, could be obtained in the river bottoms and on adjacent hillsides. The four rockfill dams would be high structures in narrow and deep mountain valleys on rivers of steep gradient. Each would rest on a rock foundation, and the materials of construction, with the exception of concrete aggregates, could be obtained immediately adjacent to the site. Rockfill dams were planned to have reinforced-concrete slabs on the water faces. Sand and gravel deposits for each project were found and reported upon, as was the timber supply available at each site and the sources of manufactured lumber, cement and labor, labor prices, railroad facilities, distance from nearest railroad terminal, and location and character of highways and haul roads. Area and capacity were determined for each reservoir, the former being subdivided into cultivated, wooded and waste land. Estimates were drawn up showing the assessed and real values of land, timber and minerals in the reservoir area.

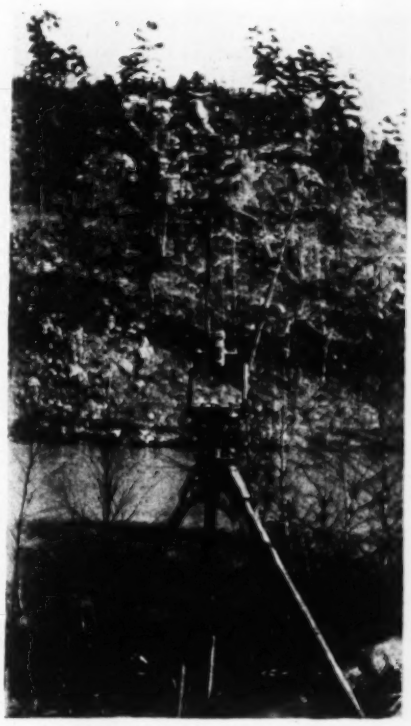

Fig. 2—One of the sites surveyed

At one of the mountain dam sites a rock bluff paralleled the river for a considerable distance and rose abruptly from the water's edge. The topography of this nearly vertical and irregular bluff was obtained by transit and stadia from the opposite bank of the river, sending two rodmen over by boat. At another site, 4 miles above on the same river and 50 miles round-trip by road, no boat was available for crossing. Here the opposite shore and mountain side were located by azimuth and vertical angles from three stations, sighting on prominent objects and features (Fig. 2.).

In Northern Mississippi the dam sites examined were in broad, heavily wooded river bottoms, the bordering bluffs being low and the stream gradients very flat. Streams in the prairie country are at an elevation somewhat above, and lie east of, the alluvial delta bordering the east bank of the Mississippi River. Dams and reservoirs on these streams would hold back flood flows from the delta lands adjacent to the foothills and thereby prevent flood conditions brought about by hill flows combining with water falling on the delta lands. Geological survey forces had just completed mapping the valleys, and photostats of plane table sheets were available, on which possible dam locations had been indicated.

Here road maps, pocket compass and auto speedometer were again used to reach dam sites quickly. Geologically, this region is much younger than at the mountain dam sites on the west border of the alluvial valley. The

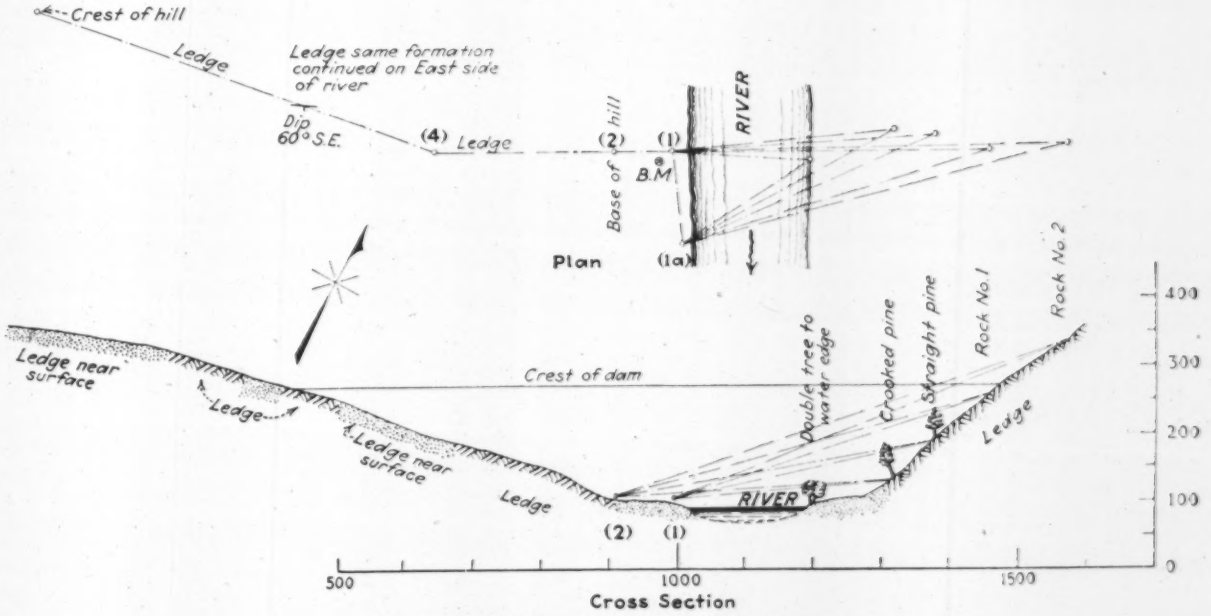

Fig. 3—Typical study for rockfill dam in Arkansas

formation consists of unconsolidated sands, gravels, clays and chalk, interbedded with shales and extending to great depths. No solid rock foundation is within reach at any of the dam sites. Materials of construction would be the clays and silts of the adjacent bottoms, together with some gravels from the bordering bluffs. These low bluffs, in most cases, fix the limit of dam height and reservoir depth. While the Arkansas mountain dams are high, 90 to 170 ft., and short, 1,000 to 1,300 ft., the Mississippi dams are low, 17 to 47 ft., but of great length, 2,500 to more than 10,000 ft. There were six of these dams and reservoirs, ranging from 9,000 to over 20,000 acres in surface area.

As previously mentioned, these broad river bottoms are level from side to side, heavily wooded, and contain no distinguishing features of topography or vegetation; in whatever direction one looks the trees are alike, marked with nothing but the muddy high-water line of a former flood. These are easy places in which to get lost, and a lost engineer is of no value to his client or to himself. To prevent this misfortune and to traverse the exact location of a proposed dam site in order to observe and study its possibilities, a simple pocket compass was used to travel a mile or two straight through the timber and brush and straight back again.

Fig. 4—Trough bridge across stream

These shallow valleys do not permit great fluctuations of reservoir surface. To supplement discharge conduits in time of unusually great and infrequent floods, controlled breaking sections were proposed in all of these dams. Two natural features which occur frequently in wide valleys were taken advantage of in locating discharge conduits and breaking sections. These are a river channel close to one side of the valley and a depression at the base of the bluffs on the opposite side. Conduits were placed in or near the river channel, using the river bed as a discharge channel. The breaking section was located so as to discharge through the depressed area and, at the same time, to be as far away as possible from the conduits and control works.

Sketches were made of all dams and appurtenances, but no underground investigations were undertaken. Each dam would require some type of cutoff and special construction at the conduits and breaking sections, calling for careful planning and construction but not involving engineering difficulties. No attempt was made to detail these features.

River Surveys

Six physical and economic river surveys were made in Arkansas, Louisiana and Mississippi, covering nearly 900 miles of winding river. Physical studies involved a determination of the sections of channels, banks, and valleys and of the height, extent and volume of floods. Data were collected dealing with population and resources, land and crop values, drainage and irrigation, existing and potential development of navigation and power, and material and labor costs. Information was obtained from chambers of commerce, farmers, bankers, real estate agents and other business men, and from assessment rolls. The resulting reports bore on the whole economic life of a region or river valley and gave a complete word picture of its people and their activities.

In making the physical surveys the same methods were employed as at dam sites. Rivers were crossed and recrossed in the same manner, and the same simple engineering tools were used, none of which were instruments of precision, except the machete. With water moccasins and rattlesnakes one must be exact. In the back country we were sometimes told, "If you go into that neighborhood with the license plates you have on your car you will meet trouble." But we never did. On the contrary, we always found the people friendly, helpful and, of course, inquisitive.

Two engineering assistants and two automobiles were furnished for the work in Arkansas; one assistant and one automobile for the rest of the investigation. Local labor was employed to make up the personnel of the parties. A typical crew with its equipment is shown in Fig. 1. Probably the most used piece of equipment was the typewriter, as all reports were written in the field. Headquarters was visited only once during the investigation and then only for a day in order to obtain maps of a new region. A boat would have been a valuable adjunct and a plane table would have furnished more detailed topography, but on no single project was sufficient time spent to warrant the assembly of a greater amount of equipment than could be transported in a single car. Methods of accomplishment were simple, but necessarily varied, to meet many and constantly changing conditions. In an operation of this kind, where time was the essence of all activities, the attention devoted to any one detail had to be governed by the time available for equally important elements. Great refinement in the study of one feature of a possible reservoir site was not warranted. The problem was to recognize the controlling features of each site inspected and to collect the essential data concerning them in the least possible time.

Railway Progress in 1930

Railway construction of new lines or extensions during 1930 reached the lowest record since 1923, with only 513 miles, as against 666 miles in 1929 and 1,025 in 1928, according to figures given in the *Railway Age*. This is not a record of railway inactivity, however, since an enormous amount of costly work has been done in the improvement of existing lines. Of the new mileage Texas has 245 miles; New Mexico, 73 miles, and Oklahoma and Oregon 27 miles each. Additional trackage on existing lines amounted to some 332 miles. About 590 miles was under construction at the end of the year, while the lines authorized by the Interstate Commerce Commission during 1930 aggregated 1,276 miles. On the other hand, about 694 miles of railway was abandoned, of which 461 miles was taken up. In 1929 the total was 513 miles. For Canada and Mexico the new mileage was 385 and 66 respectively.

Separate Sludge-Digestion Plant at Toledo Mechanically Operated Throughout

Sewage to be pre-chlorinated to prevent odor formation —3½-acre glass-covered drying beds mile from plant— Design based on 600,000 population expected in 1950

By HARVEY P. JONES
H. P. Jones & Company, Engineers, Toledo, Ohio

PRE-CHLORINATION as part of the sewage-treatment process has been included in the design of the world's largest mechanically operated separate sludge-digestion plant now under construction for the city of Toledo, Ohio. In addition to pre-chlorination, treatment will include coarse screening, grit removal, sedimentation, separate sludge digestion and sludge drying. Mechanical equipment will provide for automatic cleaning of coarse screens, continuous cleaning of grit chambers, continuous sludge removal from sedimentation tanks and mechanical agitation during sludge digestion. Glass-inclosed sludge-drying beds, comprising nearly 3½ acres, will be located a mile away from the plant proper.

Located on an artificial island near the mouth of the Maumee River, the construction of the plant is the final step in the fourteen-year program of cleaning up the river. The plant is designed to serve the 1950 population of 600,000, contributing a mean daily sewage flow of 80 million gallons. After 1950, secondary treatment will become necessary. The addition at that time of either trickling filters or aeration tanks for the settling tank effluent will enlarge the capacity of the plant to care for the 1970 population. If aeration is selected, the necessary space is available at the site.

The city of Toledo now covers an area of 27,000 acres and has a population of 300,000. The total area and population ultimately to be tributary to the Toledo intercepting sewer and treatment system is 59,000 acres and 900,000 people respectively, quite a portion of which will be outside the future city limits.

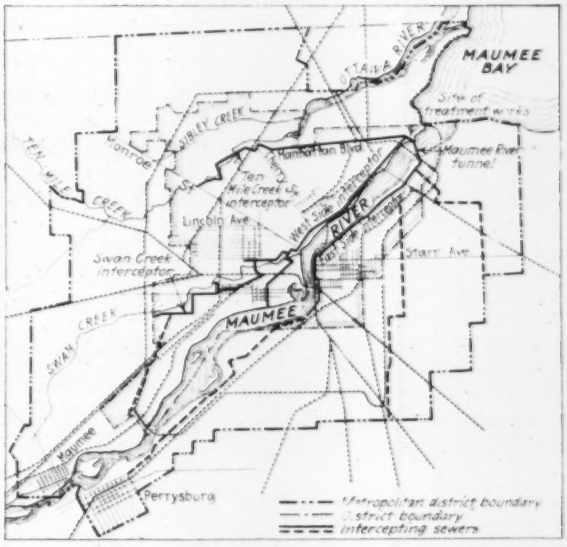

Fig. 2—Toledo Metropolitan District divided by Maumee River

Sewage from east side is delivered to treatment plant through tunnel under river.

The Maumee River divides the city into two parts. The part east of the river is served by the East Side intercepting sewer. The part west of the river is divided

Fig. 1—Digestion tanks constructed by the use of movable forms

Three tanks at different stages of construction. Forms 3 ft. high are raised by jacks as pouring progresses. Concrete pouring and form raising are both continuous operations.

into two parts, the Ten Mile Creek drainage area and the West Side and Swan Creek drainage area.

The west side intercepting sewer system diverts all of the dry-weather flow and a portion of the storm flow from the area lying west of the Maumee River to the Bay View Park pumping station, where it is discharged into the river channel through a submerged outfall sewer with multiple outlets. The system is made up of three main branches: the Ten Mile Creek interceptor, the West Side and Swan Creek interceptor and the West Side branch. All this work was completed by 1925 at a cost of $3,500,000. The basic design data, construction features and costs of this work were set forth in *Engineering News-Record*, April 1, April 15 and May 6, 1926, pp. 526, 606, and 718.

The east side intercepting sewer collects all the dry-weather flow and the first flush of storm water and diverts it to the east side sewage-pumping station, where it will finally be discharged to the sewage-treatment plant on the west side of the river through the Maumee River tunnel. This work was completed late in 1929, at a total cost of $1,500,000.

The Maumee River tunnel, 6 ft. in diameter and 3,000 ft. long, is 30 ft. below the riverbed and was constructed of concrete under compressed air with pressures ranging from 15 to 25 lb. A single shaft was sunk on each side of the river, and the headings were brought together about midway between the shore lines. Fig. 2 shows the location of the main intercepting sewers and tunnel.

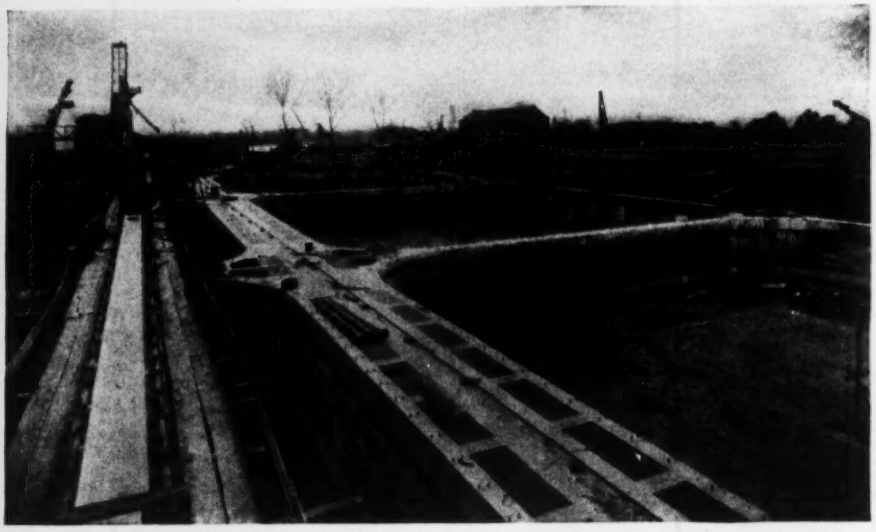

Fig. 3—Settling tanks showing the central wall containing the effluent channel

Sewage enters tanks through baffled openings at right. Overflow weirs discharge into center channel.

Previous Sanitary Improvements—Definite orders to correct the nuisance existing in Ten Mile Creek and in Swan Creek were issued to the city by the state department of health in 1913. Preliminary investigations, which included sewer gagings, census studies, measurements of streamflows, sanitary surveys, classifications of water consumption, surveys and test borings were made by the city in 1916. In 1917 a bond issue was passed at the general election, and in 1919 detailed plans for the west side system were completed.

Sewage Treatment Authorized—Complaints made to the state department of health in 1924 by townships contiguous to Toledo and local agitation to remedy nuisance conditions along the river front and in Maumee Bay, led to unsuccessful attempts in 1925 to pass a bond issue f[or] a treatment plant. Investigations by the state board o[f] health followed in 1926. The board advised the city o[f] the necessity of an immediate clean-up of the conditions and in November of the same year a bond issue o[f] $4,500,000 was carried, $2,500,000 of which was for [a] treatment plant and the remainder to complete the intercepting sewer system.

In January, 1927, immediately following the favorable action on the bond issue, the author's firm was employed by the city to prepare contract plans for the necessary intercepting sewers and to report on the sewage-treatment plant. In December, 1927, a general report on the location and type of treatment works was submitted to the city and to the state board of health. The treatment recommended consisted of sedimentation, sludge digestion, sludge-drying beds and chlorination of the effluent, with provision for the future addition of aeration tanks. The report was adopted by the city and sanctioned by the state. The plans and specifications were so prepared as to permit bids on various types of mechanical equipment.

Bids received in June, 1929, on the treatment plant were rejected in July, the work readvertised and bids again received in August. In the readvertisement of the project alternate proposals were requested "based upon a partial or entirely different type of sewage works or the use of mechanical equipment other than shown in the plans." The lowest bid following the readvertisement of the project provided for screening instead of sedimentation. In the meantime, the health officials of the states bordering on the Great Lakes, signatories in 1928 to the Great Lakes drainage basin sanitation agreement, met and amended their original agreement to provide that "minimum treatment shall be efficient sedimentation." Backed up by this resolve and in conformity with previous approvals of tank treatment, the Ohio state board of health refused to approve the plans of the screening plant. Shortly thereafter, a contract was awarded for the plant as originally designed, using the sedimentation process.

Site of Treatment Plant—A site adjacent to the present Bay View Park sewage-pumping station was selected as the most advantageous location. This was the only available site which would not require drastic revision of the pumping station and abandonment of the submerged outlet. Ample space is available for future extensions. The lowest cost for which similar treatment could be provided elsewhere was estimated to exceed the cost at the selected site by $750,000.

Pre-Chlorination—The sewage to be treated will be delivered to the plant through two conduits, one leading from the uptake shaft of the Maumee River tunnel, and the other from the Bay View Park pumping station. The volume of flow in each conduit will be measured by Venturi meters and the sewage chlorinated immediately thereafter. Pre-chlorination was decided upon in order

to eliminate disagreeable odors as well as to reduce the bacteria.

The chlorination plant is designed to have an ultimate capacity of 18,000 lb. of liquid chlorine per day, which will be equivalent to a dosage of 15 p.p.m., based on the maximum dry-weather flow of 140 m.g.d. anticipated in 1950. It is expected that secondary treatment will be installed at that time and the need for heavy chlorination will be reduced.

Chlorine will be received in ton containers and weighed on platform scales. Due to the large quantity necessary, evaporators will be used to reduce the amount of space required. Provision will be made for chlorinating the sedimentation-tank effluent if such treatment is subsequently found to be desirable.

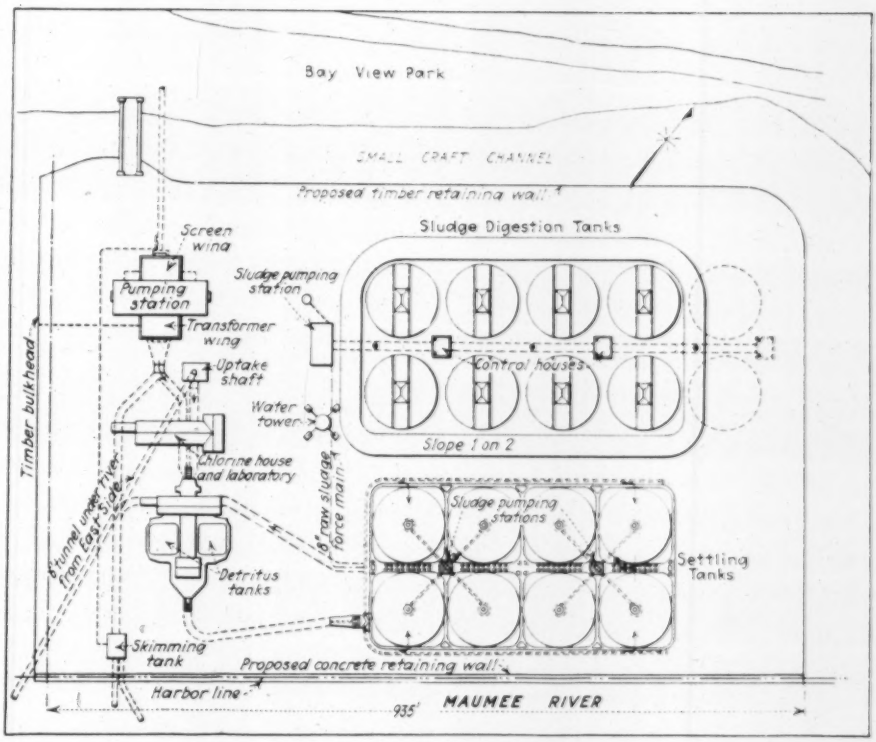

Fig. 4—Plant built on artificial island

Space available for future addition of digestion units.

Coarse Screening — Bar screens with ½-in. clear openings will precede the detritus tanks. Screenings will be removed mechanically and transported by motor truck to the municipal incinerator plant to be burned with the city's garbage. The cleaning mechanism will be automatically started by a float-controlled switch when the loss of head reaches a certain predetermined value, and it will be stopped automatically when the loss of head has been reduced to the desired amount.

Detritus Tanks—Grit, sand and other inert materials will be collected in two mechanically cleaned detritus tanks 40 ft. square. Owing to the desirability of duplicate units, the tanks were laid out for 1970 requirements. The design adopted provides a detention period for 1950 requirements of 1.1, 0.8 and 0.7 min., respectively, for anticipated average dry-weather, maximum dry-weather and maximum storm flows. Velocities of sewage through the tanks corresponding to these detentions are 0.6, 0.8 and 0.9 ft. per second. When handling flows anticipated for 1970, the detention periods will be 0.8 min. for average dry-weather flow, 0.7 for maximum dry-weather flow and 0.7 for maximum storm flow, corresponding to velocities of 0.8, 0.9 and 0.9 ft. per second.

It is not expected that the quantity of grit at the Toledo plant will be as large as that ordinarily found in sewage from a combined system of sewers, due to the type of regulator used in connection with the interceptor system. The removal of grit, even though the quantity is small, was decided upon, however, to prevent the possibility of complications in the operation of the sedimentation tanks and digesters. The mechanical cleaning is believed more conducive to uniform performance in separating sand and grit from the sewage than the intermittent cleaning of a plain grit chamber.

Sedimentation—Separate tanks for sedimentation and digestion were selected in preference to two-story tanks on account of the better results anticipated and the lower initial cost. Developments within the past few years have clearly demonstrated that the rapidity with which sludge digests is dependent upon the temperature and the hydrogen-ion concentration of the sludge. Control of these factors as provided for in advanced separate-digestion practice is expected in the case of the Toledo plant to reduce digestion volume, minimize the formation of scum and foam and eliminate the production of disagreeable odors.

There will be eight sedimentation tanks, each 90 ft. square, with a 10-ft. side water depth. Continuous sludge-removal equipment, including devices for skimming the surface of the sewage, will be installed in all tanks. Settled sludge will be removed by diaphragm pumps, one for each sedimentation tank. The volume provided in these eight sedimentation tanks corresponds to detention periods, based on 1950 requirements, of 1.45, 0.83 and 0.70 hours for anticipated average dry-weather, maximum dry-weather and maximum storm flows, respectively. Velocities of sewage through the tanks, corresponding to these detentions, are 1.04, 1.80 and 2.18 ft. per minute. Under estimated 1970 conditions the detention periods will be adequate if secondary treatment is added.

The tanks are arranged in two rows of four each, with the rows separated by a common effluent channel 8 ft. wide by 8 ft. 9 in. deep directly above a common pipe gallery. The effluent channel receives the clarified sewage from weirs extending the full width of each clarifier and leads to the existing outfall sewer to the main ship channel of the Maumee River. An automatic skimming device for the collection of scum, oils and grease is provided and consists of a skimming arm attached to and rotating with the traction-clarifier mechanism.

Raw-Sludge Pumping Stations—There will be two raw-sludge pumping stations, each located in the center of the cluster of the four tanks it serves. Four diaphragm

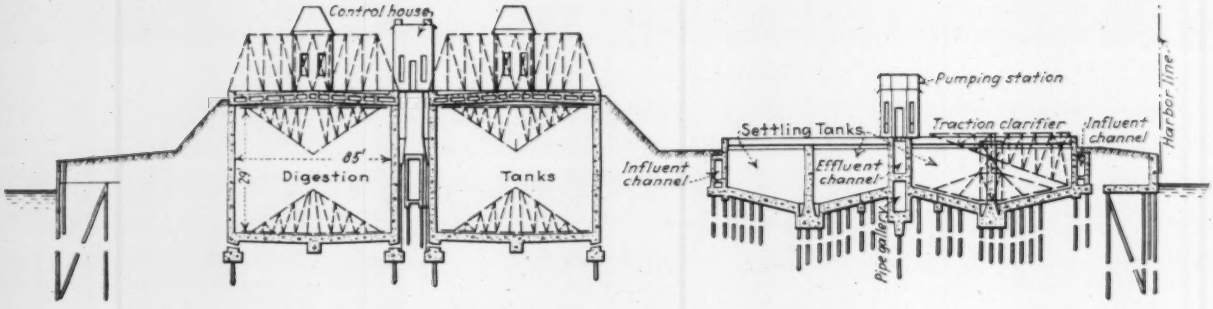

Fig. 5—Section through digestion and settling tanks

Sludge removed continuously from settling tanks. Mechanical agitation in digestion tanks to aid digestion process.

pumps, one for each sedimentation tank, will be located in each pumping station, connected to their respective tanks by 6-in. cast-iron pipe lines. These pumps discharge into a well from which the sludge will be sent to the digesters by centrifugal pumps.

Sludge Digestion—The digestion-tank installation has been planned for 1950 population requirements. It will consist of eight tanks, 85 ft. in diameter with a side depth of 29 ft. The tanks will be covered and in addition will be equipped with mechanical agitators and gas-collection domes. The collected gas will be burned in thermostatically controlled boilers to furnish heat for maintaining the optimum digestion temperature.

The total effective capacity of the eight digestion tanks will be 1,340,000 cu.ft., equivalent to 2.23 cu.ft. per capita, based on an anticipated population of 600,000 in 1950. It should be noted, however, that the tank volume provided allows for six months' sludge storage during the winter. In 1950, when it is planned to add secondary treatment in anticipation of 1970 conditions, separate provision for sludge storage can be made. This would make it possible to utilize throughout the year the total tank capacity, which, on this basis, should be ample for a population of 900,000 or more.

Raw sludge will be pumped from the pumping stations adjacent to the sedimentation tanks to the digestion-tank control chambers and thence to the digesters through a 6-in. cast-iron pipe line. Digested sludge will ordinarily be drawn from the bottom of the tanks through a 12-in. cast-iron pipe line, terminating in the control rooms. Provision is also to be made whereby it will be possible to draw digested or partly digested sludge from the side of the tank at a point 7 ft. above the bottom. Five 3-in. sampling connections will be located 4 ft. apart vertically on the side of the tanks, so that sludge may be drawn and analyzed to determine the degree of digestion at various depths.

The gas domes will be located close to the center of the concrete covers, the under sides of which will slope upward toward the domes to facilitate gas collection and to prevent the formation of gas pockets. Gas lines will terminate in the control chambers. Six-inch overflow lines will run from a point well below the water levels in the tanks to externally located weir boxes, which serve the double purpose of permitting excess solution to drain back by gravity to the sedimentation tanks and of maintaining a constant pressure head of water on the gas in the dome.

The two control chambers will have three floors each and are to be located at the centers of groups of four digesters. The lowest floor will contain the piping and valves leading from the digestion tanks and all the piping leading from the gallery between the two rows of tanks. The valves on the lines leading to the digested-sludge pumping station, located at the end of the gallery, will also be located on this floor but will be manipulated by hand wheels from above. On the second or intermediate floor the boilers, hot-water circulation pumps, etc., will be installed, together with the various accessory devices incidental to the gas utilization and sludge-heating system. The ground floor will contain the valve stands for controlling the disposition of the raw and digested sludge and the gas meters for measuring the amount of gas collected.

Sludge Disposal—Digested sludge will be pumped through a 12-in. cast-iron pipe to glass-covered drying beds, located about a mile northwest of the treatment plant. Dried sludge is to be used to fill in low-lying ground near the beds, leading thus to the reclamation of land heretofore of little value.

The sludge beds for the present will be four in number, each 242 ft. long by 162 ft. wide. Provision has been made for the future addition of four more beds. The beds will be divided by means of removable boards into a series of compartments 20 ft. wide and extending the full width of the beds. Ten-inch sludge lines laid below the surface will terminate in 8-in. risers with double inverted U-spouts, one riser for each compartment. Each compartment will be served by 24-in industrial railway tracks extending the complete width of the building for accommodating the cars to be used in the transportation of the dried sludge.

The drying beds will have a net effective area of 150,000 sq.ft., equivalent to an allowance of 0.25 sq.ft. per capita, based on the 1950 population. It is estimated that eighteen to twenty dryings can be obtained each year with covered beds of this type.

The following tabulation shows the estimated costs of the various main subdivisions of the sewage-works. The actual bids were approximately 5 per cent under the estimates.

Chlorination plants	$ 75,000
Coarse screening and grit removal	66,000
Sedimentation and digestion	1,440,000
Outfall sewer	10,000
Sludge-drying beds	200,000
Roads, walks, grading	60,000
Retaining wall on plant site	120,000
Total	$1,971,000

The construction of the treatment plant is being carried out under the direction of William H. Schroeder, director of public service. The consulting engineers on this project are H. P. Jones & Company, of Toledo. The contracts have been awarded to the A. Bentley & Sons Company, also of Toledo.

Abolition of Township Road Administration Urged by Cooperative Road Survey

Wider territorial jurisdiction over highways required by present waste and by uneven distribution of taxable values—North Carolina county-road survey compels belief in greater centralization

A COOPERATIVE SURVEY of county road mileage and financial operations of the counties of North Carolina was undertaken July 16, 1930, by the state highway commission of North Carolina, the state tax commission of North Carolina and the Bureau of Public Roads. The purposes of the survey were to ascertain for each county the mileage and location of county and township roads, and to determine the amounts and sources of road revenue, the purpose for which expenditures of road revenue were made, the amount of bonded indebtedness outstanding for road purposes, rates of taxation levied for road purposes, and other information which would be of use in a general examination of the local road financing and management in North Carolina.

Because many of the conditions found in North Carolina are characteristic of other states, the conclusions and recommendations of the survey are given here as of general interest. The full text of the report is published in *Public Roads*, the journal of the Bureau of Public Roads, Washington, D. C.—EDITOR.

RURAL HIGHWAYS are no longer a township matter; at least 25 per cent of the rural roads outside of the present state system are of intercounty importance. Township road officials, executing their offices as part-time occupants, with their regular vocations requiring their best efforts and attention, are not qualified to meet modern traffic needs and requirements with the full use of modern equipment and procedure found so useful in the construction and maintenance of state highway systems.

County Road Expenditures

It is at least an open question whether or not there are too many counties in North Carolina. Ten counties contain 42 per cent of the assessed valuation of the state, 20 contain 56.7 per cent, 30 contain 67.8 per cent, and 40 contain 76.5 per cent. This situation reveals that 60 counties contain only 23.5 per cent of the wealth, with the result that fixed charges necessary to maintain a county seat and the officials required by law impose a tax upon property far greater in percentage than in the counties of the first groups.

Per capita expenditures are highest in the richest and poorest counties, while the tax on property is at its lowest rate in the richest counties. It is apparent that a low tax rate in the wealthy counties produces sufficient funds to carry out maintenance with a surplus for construction; while, on the other hand, the poor counties are compelled to raise their rates in order to provide for the absolutely necessary road-maintenance requirements.

In the conditions brought to light by these comparisons lies the crux of one of the most serious problems of local highway administration in North Carolina, as in other states. It is clear that the root of the difficulties springs mainly from two facts: (1) That the county unit is not sufficiently large to include areas of rich and poor development within the same administrative borders; and (2) that the area of the average county and the extent of its road mileage are not sufficient to permit of full utilization of the force and equipment required for economic highway operations.

Thus, the small wealthy county is not much more favored than the large and poor county. Though the latter is likely to suffer economic loss by reason of the poverty of its equipment and resources, the former is almost equally susceptible to loss by reason of the incomplete utilization of a rich endowment.

Reduction in Number of Counties Desirable

Considerations of this nature apply not only in the field of highway operations but in all other phases of county administration as well. They suggest that it would be desirable that study be made of the need for continuance of the present number of counties. With the present facilities for travel provided by the state highway system, at least half of the present number of counties could be consolidated, and the residents of the larger counties would be in closer touch with the county seats than the inhabitants of the present counties were ten years ago.

With respect to highway administration similar advantages would accrue from a pooling of convict forces and machinery for the common use of several counties, comprising a group of sufficient size to permit of an equalization of the financial burden and a more complete utilization of resources. As a practicable measure it appears that the grouping represented by the twenty judicial districts of North Carolina merits careful consideration.

In the fact that county authorities were so unfamiliar with the highways under their control as to have reported in 1927 a total mileage exceeding by more than 17,000 miles the mileage discoverable in 1930; and in the further fact that such improvements as have been made have been distributed apparently with little regard to the relative importance of the highways; in these facts revealed by the survey there is more than an intimation of inefficiency in county administration as at present organized.

In the enormous total expenditure for gasoline, oil and grease there is strong evidence of waste and maladministration. In the practice of bonding for ordinary annual expenses of maintenance and repairs there is strong evidence of the need of supervision by competent financial authority.

It is also evident that a part of the cost of state and county law enforcement is being paid under the guise of road expense. There is no reasonable excuse for the payment of criminal court costs from highway funds. Whether or not it is possible, in view of the constitutional limitation upon property taxation, to correct this anomaly is a question that deserves consideration.

Ad valorem taxes collected during 1930, including current and delinquent taxes, imposed a burden for the state as a whole of 19.3c. for $100 valuation. Ninety counties imposed rates of less than 35c., while seven counties levied taxes at rates ranging from 39c. to 75c. per $100. These rates, in general, are very moderate, and the tendency to the higher rates is observed in those counties whose necessity for existence may be questioned.

Additional funds, if required for local road purposes, should be secured by additional local taxes. The state gas tax and motor vehicle fund has been reduced to the point where further diversions of funds to local purposes would endanger the present state plan of financing, constructing and maintaining the state highway system. The present gasoline tax rate is now 5c. per gallon, and this approaches the refinery price of gasoline. Additional gasoline taxes, if imposed, would tend to become a sales deterrent, probably reducing the income derived from that source.

Recommendations

1. It is recommended that the present law, giving counties the option of using their allocation of gasoline tax for general county debt service or for road purposes, be amended so as to limit the use of such funds to road purposes. This law now requires that expenditures of the proceeds of the 1-c. gasoline tax for local road purposes be made under the supervision of the state highway commission. The gasoline tax is imposed upon motorists to provide for highway improvement and upkeep, and a diversion of these funds to other purposes should not be made.

2. Recent additions of county roads to the state highway system have created a condition whereby the commission, with its present supply of funds, will not be able for many years to improve in accordance with traffic requirements the mileage now under its control. Further additions to the present state highway system or diversions from the state highway fund to other purposes should not be made.

3. This investigation reveals that under the present county and township organizations road funds are, in many instances, expended without regard to the traffic importance of the particular roads improved. To remedy this condition provision should be made for a classification of local roads on the basis of traffic surveys and other investigations by state and local officials working in cooperation, and for the development of a financial plan to provide for the progressive construction and annual maintenance of the several classes, consistent with the resources available and the traffic importance of each class. Pending the development of such a plan there should be no increase of taxation for local road purposes.

4. Machinery purchases, operation and upkeep for local roads are the occasion of much uneconomical expenditure. Some adequate state supervision and control should be established so that necessary machinery purchases may receive the benefit of the reduction in price to be obtained by group purchasing, that the selection of machinery may be more in accord with the actual needs, and that large units of equipment needed for only occasional work may be moved from one point to another, to the end that waste by idleness of this class of equipment which now exists can be avoided.

5. It is apparent that efficient utilization of the present county convict forces presents great difficulties, especially in the ordinary maintenance of the roads; and it is likewise apparent that there are few counties that will have sufficient money available for construction purposes in the immediate future to give profitable employment throughout the year for their convict forces. It seems necessary, therefore, that in order to work county convicts economically they must be divided under two general groups, so that those who are classed as "honor prisoners"—those who can be worked without guards—can be utilized in ordinary maintenance work by the counties; and that those prisoners who have to be worked under guard, and therefore in larger groups, may be administered under some plan of district organization composed of several counties operated under the control of the state prison. Local road organizations could then obtain from this district camp groups of prisoners from time to time for use in the construction of roads when funds are available for that purpose; and the district prison camp could develop such other lines of work as would supplement the road work that was available.

6. All township and special road district organizations should be abolished at an early date, and all control over the roads now under their supervision should be vested in organizations of wider territorial jurisdiction.

7. Additional powers should be vested in the North Carolina county governmental advisory commission over budget and accounting affairs in the counties. At present these powers are advisory. The addition of supervisory and regulatory powers to this commission would be of great value in further standardizing financial procedure and safeguarding public expenditures.

8. Plans should be formulated whereby a state purchasing agency may serve the local road organizations in the standardization and purchase of road equipment and supplies.

9. Finally, it is recommended that the state highway commission be charged with general supervision over improvement and maintenance of the roads classed as of major importance under the classification of local roads on the basis of traffic surveys, as proposed in paragraph 3.

Magnetic Road Sweeper Collects 7 Tons Metal in 61 Days of Operation

A magnetic road sweeper or nail picker, put into service last August by the North Dakota state highway department, in 61½ days of operation covering 1,172 miles collected 13,891 lb. of metal, according to the November issue of the *North Dakota State Highway Bulletin*. Running at a speed of 6 miles per hour, the picker covers a swath 8 ft. wide. Three trips are necessary to cover a stretch of road entirely. The machine averages 19.1 miles of road per day. The following table shows the amount of ferrous material collected per mile of road in different sections of the state:

Between	Length of Section, Miles	Ferrous Material Collected, Lb.	Days Operation	Road Covered Per Day Miles	Metal Collected Per Mile, Lb.
Bismarck-Jamestown	88	913	5	17.6	10.4
Jamestown-Fargo	96	1,790	5	19.2	18.6
Fargo-S. D. Line	76	559	4	19.0	7.4
Fargo-Grand Forks	90	1,111	4	22.5	12.3
Grand Forks-St. Thomas	55	792	3	18.3	14.4
Grand Forks-Devils Lake	99	1,389	5	19.8	14.0
Devils Lake-Minot	132	1,860	7	18.9	14.1
Minot-Montana Line	161	1,783	9.5	17.0	11.1
Minot-Bergen	36	406	2	18.0	11.3
Minot-Junction SH5	62	600	3	20.7	9.7
E. Junct. 9-W. Junct. 83	36	170	1.5	24.0	4.7
Minot S. H. 5	38	580	2	19.0	15.3
Minot-Washburn	76	941	3.5	21.7	12.4
Dawson-Medina	23	154	1	23.0	6.7
Jamestown-S. D. Line	84	616	5	16.8	7.3
Ellendale-Ludden	20	227	1	20.0	11.3
Totals or average	1,172	13,891	61.5	19.1	11.9

Basket-Weave Mattress Revetment on the Missouri River

Fig. 1—Constructing basket-weave mattress
Header of wire-wound brush in foreground behind anchor piles. Selvage edge shown at right.

Mattress fabricated in place from a barge warped outshore from shore-line anchor piles—Upper bank graded and covered with riprap—Typical repair operation described

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BRUSH MATTRESS for bank revetment on the Missouri River differs from both the framed mattress (*Engineering News-Record*, May 1, 1930, p. 720) used on the Mississippi below the Red River and the fascine mattress (*Engineering News-Record*, July 3, 1930, p. 4) used above the Red River. It is a basket-weave fabric, comparatively thin, produced by manual operations and requiring only a limited amount of plant. In this article basket-weave mattress practice is presented by describing original revetment and revetment repair operations. The illustrations of actual operations are equally important with the text in explaining this interesting method of using bank and bar willows for revetment. —EDITOR.

THE distinctive feature of brush-mattress revetment as it is used for bank protection on the Missouri River is that the brush is woven into a fabric having a measure of integrity without the binding cables and frames that give the mattress unity of structure. Mattresses are fabricated afloat over the underwater bank where they are to be sunk. When completed, they are sunk by loading them with stone; the upper bank, sloped evenly from the shore edge of the mattress to the top, is paved with riprap. A typical revetment is shown in Fig. 2.

Mattress Construction for New Revetment

The standard mattress is 86 ft. wide and 1 ft. thick and contains approximately 0.7 cords of willow per 100 sq.ft. The specifications usually name bar-growth willows, cut not longer than two weeks; but if the willows are cut during the winter, when the sap is down, and are stacked butts down, they are serviceable the following spring. The willows should have 1 to 1½-in. butts and be from 10 to 25 ft. long, with the limb growth cut from half of the usable length.

A mattress is begun by constructing a header (a loose roll of brush about 12 in. in diameter) normal to the bank, as shown by Fig. 2, or parallel to it, as indicated by Fig. 1. This header extends the width or length of the mattress section being woven. To form the "stitch," two or three "reachers" (largest willows) are thrust butt first into the header at an angle of about 45 deg. Across the reachers "binders" (five or six small willows) are thrust into the header normal to the reachers. The header is then tightly bound with ⅜-in. galvanized steel strand. Stitching is then continued as begun, under and over, with the butts thrust 1 to 2 ft. into the completed mattress. By this procedure all willow tops are underneath, and the mattress has the basket-weave appearance shown by Fig. 1, and in larger detail by Fig. 5. Across each exposed edge of the finished mattress a selvage is woven.

When the mattress section is woven, it is knitted into a unit by a system of galvanized strands. For the standard 86-ft. width there are six pairs of longitudinal strands, one strand underneath and one on top of the mattress. Then strands running crosswise in pairs are spaced 16 ft. apart. At each intersection, after all the slack has been eliminated, the two strands underneath and the two above are fastened together through the

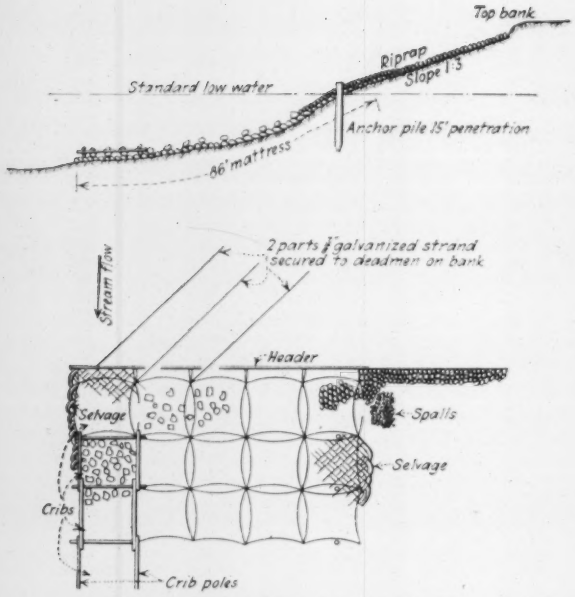


Fig. 2—Basket-weave brush mattress

mattress by a four-part, U-shaped clip. The lower strand of each pair of cross-strands is drawn over the selvage edges and fastened to the upper strand with a square knot. Fig. 2 indicates the strand arrangement as described.

The mattress is finally finished by forming pole cribs along the river edge, Fig. 2. Two continuous rows of poles 16 ft. apart and 2 ft. high are laid parallel to the river edge. Across them 16 ft. apart other poles are laid. These poles, about 20 ft. long with a 2-ft. lap, are lashed to the mattress with a ⅜-in. strand. The purpose of the pole cribs is to prevent the stone ballast from rolling off the mattress when it is sunk on a subaqueous inclined bank.

The mattress extends a short distance up the upper bank, as shown by Figs. 1 and 2. This upper zone is paved with riprap continuous with the upper bank paving. It is fastened to the bank by a row of anchor piles driven to a penetration of 15 ft.

Constructing Repair Mattresses

Failure of revetment structure (Fig. 2) may be (1) a bank paving or riprap failure, or (2) a mattress failure. Failure of the mattress results in destruction of the bank paving, but failure of the bank paving does not necessarily result in destruction of the mattress. The most common form of failure is undermining of the riprap by water flanking the shore edge of the mattress. Flanking is repaired by constructing a new mattress to bridge the gap between the old mattress and the shore, and regrading and repaving the bank. Such mattress construction follows the procedure described for new construction adapted to meet the conditions. In the repair operations described, interesting modifications of mattress construction are indicated.

The Narrows Revetment Near Council Bluffs—The task at this point was to construct a curtain mattress joining an old revetment and protective work installed by a railroad whose tracks were threatened by a cutting bank. Construction was begun and completed during

Fig. 3—Curtain mattress after thickening

Basket weave can be thickened indefinitely by weaving new brush into it.

Fig. 4—Brush and wire-mesh mattress built on ice

Mattress header in foreground. Stakes along river edge mark holes for dynamiting the ice.

Fig. 5—"Stitch" of basket weave

Fig. 6—Curtain mattress protecting cutting bank
The brush mat was woven over wire mesh laid on cables.

the winter (1929-30) in order to utilize the ice for a mattress-weaving platform, as no floating plant was available.

As the mattress was to be about 100 ft. wide, 200 ft. of ⅜-in. galvanized wire cable was laid, normal to the bank, every 12 ft.; the extra and outer 100 ft. of cable was in reserve for looping back over the completed mattress. Widths (54 in.) of 9-gage galvanized 6-in. wire mesh were laid over the cables, parallel to the bank, and extended over the bank onto the ice. The widths were sewed together with wire strand. Over the wire mesh the usual Missouri River type, basket-weave mattress was constructed and lashed thereto. The reserve lengths (100 ft.) of cables were then doubled back over the completed mattress to the bank and the ends securely fastened to deadmen. After the mattress undermined from current action, the looped cables would act as slings and prevent the mattress from pulling apart. To ballast the mattress, rows of stone were placed about every 5 or 6 ft. across the mat, each row having a covering of wire mesh to hold the ballast in place. Additional stone was placed along the outer or river edge and wire mesh placed over it and made fast to the mat (Fig. 6).

After the ice melted and the mattress began to function as a curtain, it was found that the river attack was more direct and severe than anticipated and that the closest woven mattress that could be made would be necessary if bank erosion was to be prevented. Additional brush was therefore woven into the structure (Fig. 3). Reference to Fig. 3 shows a point projecting into the river, always a fertile source of trouble. The mattress was aligned so that the outer or river edge would pass to the right of the tree in the right background, thus permitting the point to erode. Erosion was assisted with dynamite and the point eliminated. This mattress has functioned as planned and has thus far successfully resisted river attacks, while affording protection to the bank.

St. Mary's Bend Revetment—During the winter of 1929-30 a mattress, similar in all respects to that constructed at The Narrows, was built on land and ice (Fig. 4). Since the greater part of the mattress was on the ice, it was thought advisable to sink it directly after construction. Holes were bored in the ice beyond the mattress, loaded with dynamite and simultaneously fired.

After the ice movement in the spring of 1930, it was discovered that the mattress was too loosely woven to shield the bank from the strong current action. To remedy this condition additional brush was interwoven. Where flanking had occurred, a narrow, overlapping shore mattress was constructed and sunk. As no floating plant was available, 40 oil barrels were purchased, planked over, and the structure was used both as a mattress barge and a raft for ballasting.

Previous to the completion of the work, it was deemed advisable to extend the mattress several hundred feet upstream. In the construction of the extension the brush mattress was woven first and the wire mesh placed on top—the reverse of the former practice. Also all ballast was concentrated along the outer edge of the mattress. Reversal of wire mesh and brush mattress was due to uncertainty regarding the rate of erosion; if a year or more elapsed before the mattress functioned the brush would become brittle, break and be more susceptible to river attack than if the wire mesh were on the outside.

Upward-Flow Sewage Settling Tanks

In a recently completed English sewage-treatment plant for the Rothwell Urban District are three settling tanks of fourteen hours' detention period discharging over outlet weirs into three upward-flow tanks. *Municipal Engineering*, p. 481, Oct. 23, describes the tanks as follows:

Each of these settling tanks is divided into two compartments by a weir-wall, so that the first section is about one-sixth the capacity of the second. The heavier solids are thus arrested in the first compartments, which can be frequently cleaned out without disturbing the contents of the main tanks unnecessarily. The floors of the tanks slope to a shallow channel down the center of each to facilitate the removal of the sludge, which gravitates through 9-in. diameter pipes to sludge beds. The tank effluent passes over outlet weirs to three upward-flow tanks, each 18 ft. square and 22 ft. deep, with a total capacity of 71,000 gal., or about two hours' dry weather flow.

The bottoms of these tanks are formed to the shape of an inverted pyramid, and the tanks are specially designed to remove the light flocculent matter which escapes from the main settling tanks but the interception of which is important in order to prevent the clogging of filtering material in the bacteria beds. The inlets to these upward-flow settling tanks consist of vertical iron pipes, which cause the effluent from the main settling tanks to be delivered about 7 ft. below the top, so that it then rises very slowly and passes over outlet weirs arranged on three sides of each tank.

The sludge which gradually accumulates at the bottom is removed when necessary by gravitation through sludge pipes extending to the bottom of each tank, and is mixed with sludge from the main tanks before being discharged on to the sludge lagoons.

The effluent from the upward-flow tanks gravitates to four dosing chambers and is then discharged on to eight circular bacteria beds by means of automatic dosing siphons and revolving distributors.

Famous African Bridge Altered Without Interrupting Traffic

Two railway tracks replaced by single line and roadway—Change allows heavier wheel loads

VICTORIA FALLS BRIDGE, in Rhodesia, Central Africa, consists of a 500-ft. spandrel-braced arch with short approach spans of the deck-truss type measuring 87 ft. 6 in. and 62 ft. 6 in. It was originally designed to carry two railroad tracks with loads as follows: (1) a train on each track consisting of two locomotives weighing 1.75 tons per foot, followed by two cars weighing 1.33 tons per foot; (2) temperature variations of 60 deg. F. above or below the mean; (3) wind pressure of 30 lb. per sq.ft. on train and bridge, or 45 lb. per sq.ft. on the bridge alone.

The structure was completed in 1905, at which time highway traffic was negligible and no roadway was considered necessary. During the past 25 years vehicular traffic has increased rapidly, as has the weight of trains, so that reconstruction of the bridge deck has been determined upon in order to provide a single rail line with 20-ton axle loads, a pedestrian footwalk, and a motor highway which forms a link in the Great North Road. In the reconstruction, now entirely completed, the deck has been widened 13 ft., the additional space being obtained by an overhang at each side. The old deck consisted of cross girders 12 ft. 6 in. apart, which had the disadvantage of placing a load midway between the panel points and introducing bending stresses into the top chords. On the new deck the girders are spaced at 25-ft. intervals, coinciding with the panel points. This requires a considerably deeper section and necessitates raising the railway grade 4 ft. 7 in. Before erecting the new steelwork it was necessary to raise the track on temporary cribbing to the new level, and also to change the alignment to the center of the bridge.

During the reconstruction work traffic has been maintained, with the exception of a period of from nine to ten hours on one day of each week. Beginning on July 23, 1929, a schedule was maintained which called for the completion of one 25-ft. bay each week. Each bay included a cross girder, railroad floor section and downstream parapet, upstream parapet girder and three floor plates. Preparations made in advance of the period of traffic interruption consisted in assembling these units near the end of the bridge and in substituting bolts for rivets in that part of the old structure which was to be replaced. As soon as the last train had passed, the track was broken, the temporary timber cribbing removed, and the two old cross girders taken out and loaded onto the cars. This was done by a steam locomotive crane with a capacity of 7 tons. The new cross girder was then brought up by the crane and placed with the upstream end fastened by means of a bolt and the downstream end swung outward about 1 ft. off its bearing plate, where it was secured by means of a raking strut fastened to a part of the old deck. The railway floor section was then brought up by the crane and lowered into position so that the near end of the stringers could be bolted up to the cross girder erected with the previous bay. The crane continued to hold up the floor section while the new cross girder was pulled onto its downstream bearing and the far end of the stringers secured. Track was then laid on this section and a special making-up span, 15 ft. long, was used to connect the new work with the old. This was taken out for the erection of each new bay and replaced each time; one end was bolted to the new cross girder and the other rested on the old deck.

Locomotive crane placing track section on Victoria Falls Bridge
Temporary track elevation in foreground; temporary rail connection and footwalk section in rear of crane.

Diversion of Connecticut Tributaries for Water Supply of Boston Upheld

U. S. Supreme Court accepts master's findings of fact and law—First ruling on interstate waters where riparian rights principle prevails in both states in controversy

THE FIRST important water supply was brought to Boston from Lake Cochituate in 1848. Proceeding westwardly, the Sudbury was added in 1878 and the Wachusett in 1906, delivering water into the Sudbury system, with the Weston aqueduct supplementing the Sudbury aqueduct. The Wachusett-Coldbrook tunnel to convey the floodflow of the Ware River to the Wachusett reservoir has just been completed. Next will be built an extension to the proposed reservoir on the Swift River, through which water will flow, on occasion, in either direction, together with a dam to form the reservoir.

In supporting the special master's findings both of fact and law in the suit brought by the state of Connecticut against the state of Massachusetts to prevent the diversion of tributaries of the Connecticut River to provide an additional water supply for the Boston Metropolitan District, the United States Supreme Court has for the first time ruled in a conflict over interstate water rights in which both states have adopted the common law doctrine that riparian owners have the right to the undiminished flow of water past their land. Connecticut sought to prove (as New Jersey is doing in its suit to enjoin the city of New York from diverting tributaries of the Delaware River for its water supply) that the Supreme Court should enjoin the state for whose benefit the diversion was to be made from diverting its state waters without the consent of the state into whose waters the streams in question would flow. Besides infringements of its alleged right to control the waters in question, Connecticut claimed damages in a variety of ways, either as a riparian owner itself, or on behalf of its citizens. These alleged damages included injury to agriculture, shad fisheries, the sanitary régime of the Connecticut River, power and navigation. The issues as to power were simplified by the fact that the War Department had already granted permits for diversion of the waters of both the Ware and the Swift rivers, setting limitations on the amount to be diverted and the period of the year during which there should be absolutely no diversion of the floodwaters of the Ware (the only waters at issue in this stream) and the amount of water that at different times should be discharged down the Swift from the proposed large impounding reservoir on that stream. Damages to power were held to be prospective only and uncertain, and therefore left to possible future adjudication, together with any other questions of damages that may arise in the future.

In substance, the plan of diversion upheld by the United States Supreme Court is one put forward in a report to the Massachusetts legislature of 1922, commonly called the Goodnough plan because one of the members of the joint board created to make the investigation and report was X. H. Goodnough, then and until recently chief engineer of the Massachusetts department of health. (See *Engineering News-Record*, March 22, 1929, p. 360. Diversion from the Miller River, proposed by the 1922 commission, was forbidden by the legislature.) This plan, in turn, was, so far as the streams to be diverted were concerned, in general line with the report and recommendations of the Massachusetts state board of health, made in 1895, when the late Frederic P. Stearns was chief engineer of that body. The novel features of the 1922 plan were its emphasis on floodflow diversion, rather than taking substantially the entire available yield of the stream, and its provision for an aqueduct-tunnel that, in its westerly half, would carry water in either direction, so that when Wachusett reservoir at the easterly end of the tunnel was full the floodflow of the Ware River could be sent westward into the proposed storage reservoir on the Swift, to be returned when there was room to store it in the Wachusett reservoir.

Opposition to the 1922 plan by one of the members of the joint board and from other sources led the Massachusetts legislature to provide for the creation of another commission, with geographical representation of the various sections affected either by water diversion or in the matter of additional water supply. This commission, called the Gow commission from its chairman, Charles R. Gow, consulting engineer of Boston, recommended a quite different plan than had been proposed in 1922, the details of which it is not necessary to go into here. (See *Engineering News-Record*, Dec. 10, 1925, p. 944.) The Massachusetts legislature of 1926-27 authorized, first, the Ware River floodflow diversion, and, second, diversion from the Swift. The amounts allowed in the War Department permits are given farther on.

Pending the working out of details and legislative authorization for going to the Swift, the easterly part of the tunnel was first put under way. This is known as the Wachusett-Coldbrook section, is 14.2 miles long, was holed through in 1930 and is now actually or substantially completed ready for diversion through it of the Ware River.

Bids for the construction of the 10.4 miles of the westerly section will be received on March 27. For the entire length of 24.6 miles the tunnel is of horseshoe shape, 12¾ ft. high and 11 ft. wide. The two dams forming the Swift River reservoir will not be built at present.

An abstract of the supreme court decision, with quotations of some of its important portions, follows:

Diversion into the Wachusett reservoir of the floodwaters of the Ware River and of certain waters of the Swift River was authorized by the Massachusetts legis-

lature in 1926 and 1927. Both streams are non-navigable and wholly within the state of Massachusetts. Both are tributaries of the Chicopee, which empties into the Connecticut River just above Springfield, Mass.

Allegations of Complaints—Connecticut alleged that both it and Massachusetts recognized the common law doctrine of riparian rights and that Connecticut is an owner of riparian lands and of the bed of the river and that it also appears as *parens patriae*. The complaint urged that the proposed diversion would divert water tributary to the Connecticut to points entirely outside the watershed of that river; would impair navigation; that by taking floodwaters it would cause damage to agricultural land inundated yearly; lessen the volume of the flow of the stream, all of which is necessary to prevent offensive matter put into the river in Massachusetts from becoming a nuisance and a menace to public health; destroy property of the state of Connecticut and its inhabitants "without due process of law and cause injury for which there is no adequate remedy at law;" and that the proposed diversion is only a part of the water that it is proposed eventually to take from tributaries of the Connecticut.

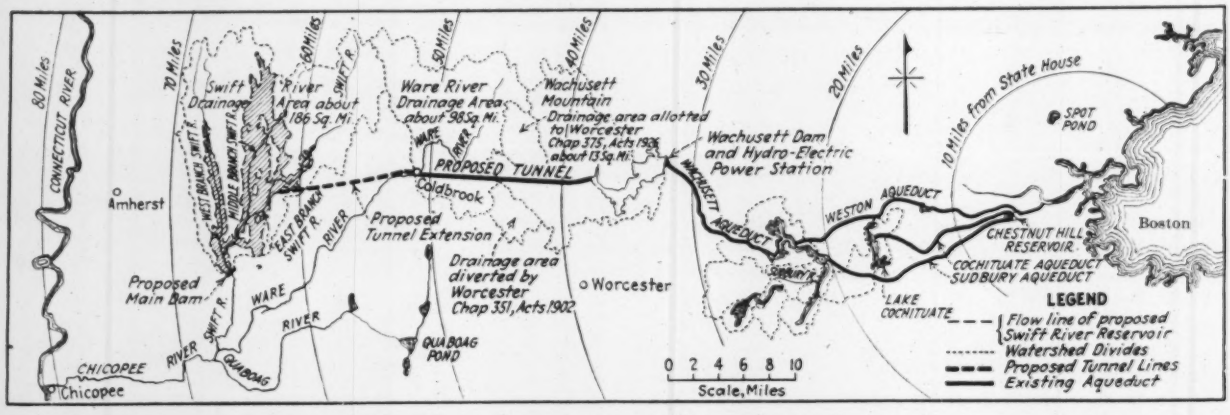
The Massachusetts Answer — Massachusetts denied that the diversion would cause any injury or damage and its amount would be negligible compared with the flow of the river where it enters Connecticut; that a public water supply emergency exists; that interference with navigation is not an open question "in the absence of proof that Massachusetts" will "divert more water than is permitted by the War Department;" that the diversion constitutes reasonable use; and that it will stabilize the flow of the river, thus benefitting Connecticut riparian owners.

Findings of Master Supported—The decision then reviews and supports the findings of Charles W. Bunn, of Minnesota, appointed by the Court as special master to take and review evidence and submit recommendations for a decree, except that it does not allow small damages to navigation proposed conditionally by the master.

Findings of Fact—A serious water shortage in the near future faces Boston and the other 34 cities and towns comprising the Metropolitan District. These 35 places have a present population of 1,900,000, which is raised to 2,860,000 on taking into account near-by cities and towns that may soon be admitted to the district. In 40 years the estimated population dependent upon the Metropolitan water supply, estimates show, will reach 4,572,000.

Permits for diversion from both the Ware and the Swift have been granted by the secretary of war after hearing both sides and examining the facts. From the Ware, floodwaters in excess of 85,000,000 gal. per day between Oct. 15 and June 15 only are authorized. All the waters of the Swift may be diverted except enough to maintain a flow of 20 m.g.d., but between June 1 and Nov. 30 there must be released from the impounding reservoir 110 sec.-ft. (71 m.g.d.) whenever the flow of the Connecticut at Sunderland, Mass., 20 miles north of the junction of the Chicopee and Connecticut, is down to or below 4,650 sec.-ft., and 70 sec.-ft. (45 m.g.d.) when the flow is more than 4,650 and less than 4,900 sec.-ft. The annual flow of the Connecticut River at the Massachusetts-Connecticut boundary line is about 17,000 sec.-ft., and the watershed above that line is 9,950 square miles. The respective drainage areas at the points of diversion are 98 and 186 square miles for the Ware and the Swift. The War Department permit allows a total diversion from the two streams of about 191 m.g.d. [Compared with 202 m.g.d. proposed by the 1922 commission, including water from the Miller River, not included in the present plan.—EDITOR.] The total area subject to these diversions is 2.93 per cent of the watershed of the Connecticut River above the Connecticut-Massachusetts line. The diversion authorized by the permit represents an average yearly subtraction from the flow of the Connecticut River at the state line of about 2 per cent, but some 94 per cent of this will occur when the depth of water at Hartford is 11.5 ft. Heretofore the government has sought to maintain 10 ft. of water below Hartford, but a War Department project contemplates a 12-ft. depth. Dredging is required yearly to maintain a channel depth of 10 ft. at numerous bars below Hartford. The required release of water from the Swift River reservoir will somewhat benefit low-water navigation. The maximum diversion will be at high water and lessen the depth 5 to 6 in., while at medium stages the diversion will be less, and at very low stages the flow will be increased. Flood heights will be less from 1 to 6 in. The lessening of spring floods will have both advantages and disadvantages, reducing some damages and increasing others, but the alleged damage to hay land through the loss of benefits from flooding is held to be uncertain and immaterial.

The small possible damage to an existing water-power



Extension of the aqueduct and impounding reservoir system of the Boston Metropolitan Water District to the Ware and Swift rivers

development at King's Island, Conn., where the owner has been authorized by the Federal Power Commission to build a higher dam and increase the available horsepower from 4,000 to 50,000, is noted; but the testimony did not show that the company has actually decided to utilize this permit or that necessary capital to do so had been provided. Existing use of power at this point would not be disturbed by the diversion, but if 50,000 hp. was ever developed, "the diversion would cause an injury of $80,000." In the master's report allowance of damages to this extent in case actual development and actual use of the permit was recommended, but, as shown farther on, the court in its decision seems to pass that over. Damage to the run of shad was not shown by the evidence nor that "the diversion will perceptibly increase the pollution of the river."

Substitute Plans Ruled Out—Two substitute projects for an additional water supply in the Metropolitan District, proposed by Connecticut, were ruled out in the decision, both on the ground that the plan in controversy was "the result of long-continued and careful study," and also because of the superiority of the waters of the Ware and Swift and several objections to the substitutes proposed. One of the plans proposed a combination of fifteen different watersheds on the Assabet, Sudbury, Shawsheen and Ipswich rivers, with pumping and purification. Most of the water from these sources is poor compared with that of the Ware and Swift, besides which "the amount would be inadequate and constitute only a part of the needed supply," and the supply if introduced might have to be abandoned. The second plan proposed taking water from the heavily polluted Merrimac River, which carries not only city sewage but also various industrial wastes "difficult to eliminate from water." Purification works for the Merrimac would require "storage for 30 to 90 days," besides aeration, filtration and chlorination. Possibilities of breakdown are mentioned. All but one of the witnesses examined "expressed preference for a supply of originally pure water over a purified polluted one."

Points of Law—In opening the portion of its decision relating to points of law, the court says:

> The governing rule is that this court will not exert its extraordinary power to control the conduct of one state at the suit of another, unless the threatened invasion of rights is of serious magnitude and established by clear and convincing evidence. New York v. New Jersey, 256 U.S. 296, 309. Missouri v. Illinois, 200 U.S. 496, 521. The burden on Connecticut to sustain the allegations on which it seeks to prevent Massachusetts from making the proposed diversions is much greater than that generally required to be borne by one seeking an injunction in a suit between private parties. North Dakota v. Minnesota, 263 U.S. 365, 374. There has been brought forward no adequate reason for disturbing the master's findings of fact. They are amply sustained by the evidence and are adopted by the court.

On the subject of Connecticut's contention (as expressed in the decision) that "under the common law in force in both states, each riparian owner has a vested right in the use of the flowing waters and is entitled to have them flow as they were wont, etc., and that "following the law enforced by each of the states within its own boundaries [the Supreme Court] should grant injunction against any diversion from the watersheds of these rivers," the decision says:

> But the laws in respect of riparian rights that happen to be effective for the time being in both states do not necessarily constitute a dependable guide or just basis for the decision of controversies such as that here presented. The rules of the common law on that subject do not obtain in all the states of the Union, and there are variations in their application. The doctrine of appropriation prevails in some states. And every state is free to change its laws governing riparian ownership and to permit the appropriation of flowing waters for such purposes as it may deem wise. U. S. v. Rio Grande Irrigation Co., 174 U.S. 690, 702.

The decision then reviews the earlier leading decisions involving interstate waters diverted for irrigation purposes—that is, Kansas v. Colorado suit to prevent the latter state from diverting water of the Arkansas from flowing into Kansas, and the Wyoming v. Colorado suit to prevent diversion of the waters of the Laramie River which rise in Colorado and flow into Wyoming. In both these cases the doctrine of prior appropriation is applied (by either one or both of the states). After dismissing the earlier decisions as not applicable to the case in hand and stating that there "is nothing in the master's findings of fact" indicating that "substantial injury or damage will presently result to Connecticut from the proposed diversions," and after passing over the damage to water power, already mentioned, with the statement that "injunction will not issue in the absence of any actual or presently threatened interference," the decision concludes as follows:

> Drinking and other domestic purposes are the highest uses of water. An ample supply of wholesome water is essential. Massachusetts, after elaborate research, decided to take waters of the Ware and Swift rather than to rely on the sources in the eastern part of the commonwealth, where all are or are liable to become polluted. We need not advert to other considerations, disclosed by the evidence and findings, to show that the proposed use of the waters of the Ware and Swift should not be enjoined.
>
> Connecticut maintains that the presently proposed diversion will not be adequate for the future needs of the Boston district and that the size and character of the works, as well as legislative reports and other circumstances, disclose an intention on the part of Massachusetts, when the need shall arise, to draw from other rivers—Millers, Deerfield, Quaboag and Westfield—tributary to the Connecticut and insists that the decree should restrain Massachusetts forever from increasing its diversion to an amount in excess of what the secretary of war has already indicated would cause no damage to the navigation of the Connecticut.
>
> The scope of the project is that shown by the acts as limited by the determination of the War Department. It involves no diversion from streams other than the Ware and Swift. Massachusetts declares that she intends to and must obey these findings of the War Department. Her statements before the master and here clearly negative any threat, intention or purpose to make any diversion of water in excess of that specified, or otherwise than as set forth in the determinations of the War Department. Injunction issues to prevent existing or presently threatening injuries. One will not be granted against something merely feared as liable to occur at some definite time in the future. New York v. Illinois, supra New Jersey v. Sargent, supra.
>
> Connecticut's bill of complaint will be dismissed without prejudice to her right to maintain a suit against Massachusetts whenever it shall appear that substantial interests of Connecticut are being injured through a material increase of the amount of the waters of the Ware and Swift diverted by or under the authority of Massachusetts over and above the quantities authorized by the acts of 1926 and 1927, as heretofore limited by the War Department. Each party will pay its own costs, one-half the expenses incurred by the special master and one-half the amount to be fixed by the court as his compensation.

Current Concrete Investigations Discussed by A.C.I.

Milwaukee meeting of Concrete Institute deals with durability, strength and cost—First report of steady-load tests of columns show progressive load transfer from concrete to steel—Separating coarse aggregate into two sizes found economical

WITH PERHAPS the strongest technical program in its history the American Concrete Institute met last week at Milwaukee, just a quarter century since last visiting that city. Attendance was excellent, the registration of some 600 showing no effect of business depression. New facts on durability, long-time strength, flow of concrete, column behavior, mixing phenomena and separation of coarse aggregate into several sizes were prominent results of the meeting.

Extensive observations of good and bad concrete structures showed the wide influence of improper construction methods on durability and also showed that well-made concrete is unimpaired after thirty years, even in severe climates. Column tests under long-time steady loading, undertaken at Lehigh and Illinois to clear up the uncertainty about effect of plastic flow of concrete on strength, showed that the concrete progressively loses load and transfers it to the steel, so that the latter after a time is stressed to its elastic limit; but whether this action means a progressive weakening of the columns remains to be learned.

Durability in Concrete

Definite insight into the causes that make concrete durable or perishable is being obtained through systematic studies of existing concrete structures in various parts of the country that are being carried on by a committee of the institute and by research engineers of the Portland Cement Association. Several hundred structures have been examined as to present condition, construction methods and service. F. R. McMillan (Portland Cement Association) and R. B. Young (Ontario hydro-electric commission) reported separate sets of observations made during this study.

In both studies certain structures were found in perfect condition despite severe exposure during 25 to 30 years (such as Peterborough lift-lock towers, Ontario; Trenton dam, New York; Pine River dam, Minnesota). Many other structures were found more or less seriously disfigured or disintegrated. Dry-mixed concrete rammed in layers, according to the practice prior to 25 years ago, has proved highly durable in many instances.

Mr. Young listed these causes of deterioration: faults of workmanship, excess water, defective construction joints, unsound aggregate (infrequent), solvent action of water allowed to penetrate the concrete. "Fundamentally," he said, "most concrete deterioration is due to its being porous. The best recipe for durable concrete is to make it so dense and impermeable that water cannot enter.

A significant warning was sounded by Mr. Young:

A concrete of today is probably more permeable and hence less durable than concrete of equal strength made ten years ago. It is the author's opinion that the widespread adoption of the strength specification for concrete is creating a situation dangerous to the industry, for the same engineers who are now adopting the newer forms of specification are still using the old standards of strength as a measure of quality, in the belief that in meeting these they are assured of a durable, weather-resistant concrete.

Compression specimens molded in 1910 showed continuous gain in strength during twenty years, in tests at the University of Wisconsin reported by Prof. M. O. Withey. The increase was marked for specimens kept in outside exposure or under water and was closely proportional to the logarithm of the age; 1 : 2 : 4 specimens increased from a 28-day strength of 2,000 lb. to a 20-year strength of 5,000 lb. per sq.in. Specimens kept indoors reached only 3,000 lb. per sq.in.; they gained little after 3 to 6 months. Whether present-day concretes will show similar gain is questionable, Prof Withey said, because of their more rapid early hardening.

D. A. Abrams (International Cement Co.), in tests over four or five years, found the increase of strength to flatten off somewhat from the linear relation to logarithm of age. His results covered both ordinary portland and high-early-strength cement. Plotting the results with log of strength against arithmetical value of water ratio, he found all his tests to fall on straight lines intersecting the axis of water-ratio at 14,000, thereby confirming his earlier formula, strength $= 14{,}000/B^x$, where x is water-ratio; but the constant B, which formerly was given as 7 for 28 days for ordinary portland is for present-day portland about 7.5 at 7 days.

Separating Coarse-Aggregate Sizes

Three states now require road concrete to be made from coarse aggregate separated into two sizes to reduce trouble from stock-pile segregation, and the practice is spreading, said T. C. Thee (Bureau of Public Roads). He reported in great detail the layouts of stock-piles, batching and mixing plants on several 1930 road jobs in Wisconsin, Texas and Arkansas. Elaborate time studies were carried on to check delays and costs. Quality tests showed that large savings could be made by cement reduction and improvement in uniformity and workability. The mix has been changed from six to five bags per cubic yard. Separation should not go beyond two sizes, however, in Mr. Thee's opinion. George W. Langley (county engineer, Sheboygan, Wis.), differed with him on this, holding that two sizes are not enough for best uniformity and economy, especially if aggregate sizes up to 3 or 3½ in. are permitted; equipment is being built that will load three sizes in one operation, so that no extra cost at the mixing plant should result.

Both Mr. Thee and A. L. Hambrecht (construction engineer, Wisconsin highway commission) reported that the two-size system used in 1930 produced such uniformity of concrete that the variation from batch to batch was less than the variation within the batch. Mr.

Langley reported strength figures which showed 30 per cent gain in beam strength of 1930 road concrete (two sizes) as compared with 1929 (no separation). In two years, 1928-1930, compressive strengths were increased by 40 per cent, due partly to proportioning the coarse aggregate by weight and partly to separation into two sizes.

Studies of Mixer Operation

New information on mixer operation was given in two papers: "A Comparison of Continuous with Batch Mixers," by Benjamin Wilk (Standard Building Products Co., Detroit); and "Determining the Characteristics of Concrete in the Mixer," by Prof. E. D. Roberts (Marquette University, Milwaukee). Views based on a third study of mixer operation were set forth by Prof. S. C. Hollister (Purdue University, Lafayette, Ind.), under the title "Studies of Concrete Mixtures."

Mr. Wilk made alternate lots of concrete blocks using (1) a batch mixer and (2) a long-trough continuous mixer, with all conditions equal except that the mixing times were about 6 min. for the batch mixer and 1 min. for the continuous mixer. The block strengths were substantially equal.

Professor Roberts' observations were made on an experimental "consistency indicator," now under development by a mixer manufacturer. It consists of a short bar crosswise of the mixer just inside the discharge end, supported by a pair of hinged arms held up to position by an oil-pressure diaphragm. Concrete being mixed falls on the bar and gives a pressure indication on the oil gage. In all cases the pressure rises during the first 20 to 30 sec. of mixing but then becomes uniform or else decreases from maximum to a lower value at which it remains uniform during further mixing. Normal-consistency concrete rises to a fairly high pressure without subsequent drop; dry concrete gives a lower maximum, also without drop; wet concrete rises to higher value than normal-consistency concrete but then drops to a value not far from that for dry concrete. In all cases the maximum is reached a few seconds after the concrete "looks uniform" in the mixer. If water is added after the pressure has become uniform, the pressure readings change to the values observed for concrete of the type of higher water content.

Discussion developed that a related device, the "Mixometer," is already in use at several West Coast concrete plants.

Professor Hollister analyzed the action of water on sand grains, keeping them separate at first, then with more water drawing them together; on cement, where it envelops groups of particles; and on stone, where it merely forms a surface coating. Temperature readings on the material in the mixer, plotted against mixing time, show a sudden increase of heating at a certain time, dependent on the mixture; this reflects a change in consistency, probably caused by the breaking up of the clusters of cement particles and resultant increase in colloid content. On these reflections, Professor Hollister believes, a new direction of concrete-mixture study may prove feasible.

Prof. W. A. Slater (Lehigh University) remarked that analyses of samples from a mixer at various times up to 2½ hours showed increase in apparent cement content by 40 to 50 per cent and decrease of sand content, together with decrease of slump; probably the sand was being ground away.

P. H. Bates (Bureau of Standards) emphasized the value of studying the physics of colloid behavior of cement and concrete. Like animal glue, cement probably works properly only with a definite amount of water.

Light-Weight Concrete

Lighter concrete will produce the cheaper building, for equal unit costs and strengths of concrete. With this premise Frank A. Randall (Chicago) analyzed comparative costs of structural frames built of concretes of various weights. Designs involved 20 roof panels, 20 floor panels, 620 columns and 120 foundations. Some of his deductions are that there is a greater effect of weight on the higher buildings, roughly twice as much difference in the 30-story as in the 5-story building; that it is worthwhile to pay 10c. more per cubic foot to secure a reduction from 150 to 130-lb. concrete in a concrete-frame building 30 stories high, and a reduction to 115- or 100-lb. concrete in a five-story building, depending on whether the floor is of solid-slab or joist construction. More savings are possible in a steel-frame building.

Prof. F. E. Richart and V. P. Jensen (University of Illinois) reported on numerous tests of Haydite concrete. They found that the water-ratio law holds, but a correction must be made for absorbed moisture. The modulus of elasticity of coarse ($\frac{7}{32}$- to $\frac{3}{4}$-in.) Haydite and sand concrete is 75 per cent, and of all-Haydite concrete is 55 per cent of that for gravel concrete. The lightness and lower modulus must be considered in all column and beam design.

To define the various weights of concrete Mr. Pittner suggested that concrete weighing 150 lb. or more be designated super-heavy, 125 to 150 lb. as heavy, 100 to 125 lb. as medium, 75 to 100 lb. lightweight and less than 75 as super-lightweight. The matter was referred by vote to committee for report at the next meeting.

Within a comparatively short time 50 per cent of cement sold will be by bulk, said Herbert Caffman. Numerous installations of central batch and mixing plants were described. Many Middle West states have adopted bulk cement as standard for highway work. An instance was noted in discussion of pumping 150,000 bbl. of cement over a river, a distance of 1,000 ft., rather than haul it 20 miles around to a dam near Wilmington, Del. After two years one operator with two bulk cement plants and two bag plants stated that the operating difficulties were such, due to quick changes in kinds of cement called for, as to make him doubtful as to the economies of the bulk-cement method. Another operator stated that his plant in New York could furnish any one of four kinds of cement and change within one minute from one to the other. He was convinced of the economies of the method.

Workability, Waterproofing and Admixtures

Several papers brought up the much-discussed subject of admixtures, as related to waterproofing and workability, and the varying interpretations of the latter term.

C. H. Jumper (Bureau of Standards) reported a condensed summary of elaborate percolation and absorption tests of concrete treated with either integral or surface waterproofings, using 1 : 3 : 6 concrete disks 5 in. in diameter by 2 in. thick for the former, and 1 : 2 : 4 concrete in 3x6-in. cylinders for the latter. Both types in only a few cases gave results as good as those of plain concrete; one or two were slightly better. R. B. Young reported tests of some 25 surface treatments intended for possible use in protecting defective structures, but after two years none were effective, and most of them not after two months.

J. C. Pearson (Lehigh Portland Cement Co.), pointed out that the laws of plastic flow indicate that two separate quantities define the concrete consistency, namely, yield value and mobility, and that one measure therefore cannot be adequate. Cement pastes of different degrees of wetness are found to have the same slope of flow-pressure curve (mobility), and the same is true of masonry cement pastes, though these latter have not the same slope as the former. It would therefore be best to ignore slump and flow table and start on the problem anew. Prof. A. N. Talbot (University of Illinois) reported that tests showed the flow table to measure wetness, which the slump does not do; flow appears to be proportional to the product of wetness and cement content.

"Workability" discussions arose in connection with several papers but without help in defining it.

Prof. G. M. Williams (University of Saskatchewan) gave the results of flow-table segregation tests on concrete with various admixtures, which tended to show that segregation is reduced by admixtures, including cement itself.

Compression Flow in Cylinders and Columns

Five years' study of flow (continuous deformation) under sustained compressive loading of cylinders was summed up comprehensively in a paper by Prof. R. E. Davis and H. E. Davis (University of California). The work shows that all concrete flows about in proportion to load continuously for at least several years; the rate decreases constantly and for wet storage may reach zero when the flow has become equal to the instantaneous compression; for dry storage the flow increases to several times as much; on release of load there is an instantaneous recovery, followed by a plastic recovery less than the plastic compression.

Flow is least for rich concrete, for concrete of high modulus, for low-water ratio, for concrete that has aged and for moist or wet storage. It is less with limestone than with sandstone aggregate.

Prof. G. A. Maney (Northwestern University) demonstrated the need of control specimens of plain rather than reinforced concrete in control specimens for flow tests, and by comparative tests of hollow and solid cylinders brought out the influence of differential shrinkage, due to more rapid drying of the outer parts of a cylinder. Prof. J. R. Shank (Ohio State University) reported that tests on prisms of limestone and sandstone showed no flow. Flow in a concrete specimen with lap-spliced reinforcing bars indicated that the flow was in bond rather than in concrete shear.

Extending the study of flow to reinforced columns of sizes from 8 in. by 5 ft. upward, Prof. F. E. Richart (University of Illinois) and Prof. W. A. Slater (Lehigh University) found remarkable verification of the expected effect of concrete flow on the relation between concrete and steel stresses.

The Illinois tests as reported covered five months steady loading but are to continue for a year, when the columns are to be tested to failure. The steady load is applied and maintained by nests of railway car springs and bolts engaging the ends of the columns. All loads are full design loads; longitudinal reinforcement varies from 1.5 to 6 per cent, and some columns are hooped.

In some of the columns the original steel stress of about 15,000 lb. per sq.in. has increased to 27,000, the concrete stress having decreased correspondingly through flow. The increase is greatest for the lowest percentage of reinforcement and greater for dry storage than for moist storage.

Professor Slater reported similar results, also after five months' observation. Steel stresses have increased from the initial 7,000 to 16,000 lb. per sq.in. to maxima of 36,000 to 42,000 lb. per sq.in. in dry storage, and 16,000 to 19,000 in wet storage. He concluded that the steel in a loaded column tends to reach yield-point stress and should continue to carry this same stress with increased flow if the spiral and the concrete are able to hold it in place laterally. This suggests that the strength of a reinforced column is the sum of the strengths of the concrete and the longitudinal reinforcement. Revision of column-design formulas may be made necessary by the final results of the tests.

Windbracing

For high concrete buildings Albert Smith (Chicago) recommended a wind load of 20 lb. per sq.ft. up to 200-ft. height, 25 lb. for the zone from 200 to 300 ft., and thus by 5-lb. stages for 100-ft. zones to 40 lb. for the height beyond 500 ft. Girder and column moments should be reduced to face of column or top and bottom of girder. Tower bracing should be continued two stories below a roof line at which it transfers to other lines. Wind stresses may be calculated for 500 lb. in concrete (not counting load steel) and 27,000 lb. in wind steel. Column combined loads may be 150 per cent of the allowed dead and live load capacity.

Other Papers

Concrete control at Diablo Dam was described by H. F. Faulkner and R. R. Hubbard (Seattle). P. M. Woodworth (Portland Cement Association) reported measurements of the shrinkage of concrete-block masonry. Central mixing plants were described in a full review by F. I. Ginsberg. An interesting piece of engineering construction, building a 20,000,000-gal. concrete reservoir in Detroit, was described by A. B. Morrill (Detroit department of water supply). Profs. R. E. Davis and G. E. Troxell (University of California) outlined the unexplored field of knowledge of behavior of concrete in large masses—chiefly effects of temperature rise due to setting and the subsequent cooling, but also shrinkage, residual stress, permeability, flow and durability. These papers, like the others, received virtually no discussion because of the crowded program.

Specifications

Much specification work was done. New specifications were reported on the use of color in troweled surfaces, the manufacture of concrete-masonry units, concrete burial vaults, ready-mixed concrete, fabricating and setting reinforcing steel, concrete work on the small job, cast-stone standards. The specification for concrete work on ordinary buildings reported by A. R. Lord a year ago was revised by making use of admixture permissible on the basis of test reports showing no harmful effect. A thoroughly worked out specification for ready-mix concrete, covering both central-mixed and truck-mixed, reported by M. M. Clair (*Journal* of the Institute, Nov. 1930) was adopted with a revision allowing more than one hour elapsed time if the concrete is still of good consistency, and a revision allowing greater slump than 6 in. if no segregation occurs.

Field Notes on

Water-Supply Conditions in the Drought Regions

How THE DROUGHT of 1930 is affecting community water supplies is reported in field observations by one of the editors of *Engineering News-Record*, the second of which appears below. Drought conditions up to the end of the year were summarized by Dr. F. H. Newell in our issue of Feb. 5. Despite some local rains the drought continues to cause concern among engineers in water-supply service, especially in some of the South-Central states, where last summer's rainfall was 50 per cent or less of normal. They find themselves entering the year 1931 with depleted reserves or entirely lacking reserves and with little prospect as yet of a return to normal. —EDITOR.

JEFFERSON CITY, MO.

MISSOURI water supplies have not been placed in so alarming a condition as have some of those in Illinois by the 1930 dry period. Well supplies predominate in the section of the state that experienced an appreciable rainfall deficiency, and with most of them drop pipes extend deep enough to be below the present low groundwater level. Impounded supplies have been depleted in only three towns to a degree sufficient to cause concern to the water-works management, although one village is in dire straits as a result of its inability to fill a new reservoir.

Rainfall during 1930 attained 79 per cent of its normal value over the state as a whole. The western and northern portions received precipitation approaching the normally expected amounts, while the area receiving less than 70 per cent of normal lies in the southeastern corner of the state, roughly south of the Missouri River and east of the Osage. This area and its continuation across the Mississippi into southern Illinois gives evidence of its dry condition by the appearance of its streambeds. Although this season is normally one of low water, the present stages of the river are almost without precedent. In traveling through the country one becomes accustomed to seeing wide streambeds with only a slow narrow trickle of water flowing somewhere near the center. Storage ponds for railroad water supply usually show wide expanses of black muck.

Fortunately for Missouri, however, most of the water in this region is obtained from deep wells. It is only in the part of the state north of the Missouri River that the underground water becomes too highly mineralized to be satisfactory, and resort is had to surface supplies. In the dry area, therefore, there are only a few communities whose supplies have been seriously affected.

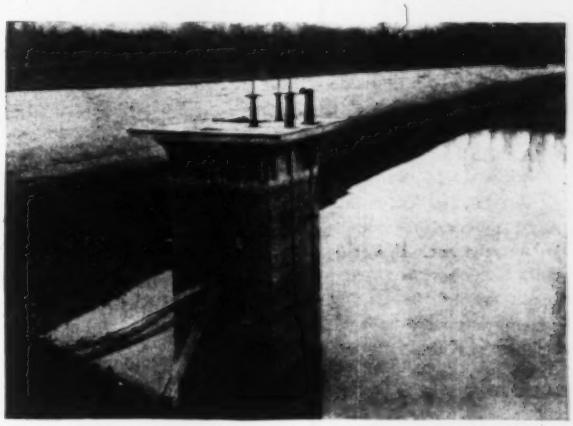
Pumps Operated Only One-Half Hour

Quite recently Harrisonville constructed an impounding reservoir capable of holding 35 m.g., nearly a year's supply for its population of 2,300. That reservoir has never filled up. The town's supply, necessarily dependent upon the present flow in the river, has become practically exhausted, and heroic measures have been taken to reduce consumption. Pumpage of water into the distribution mains has been limited to but one-half hour per day, and between times the consumers must make use of storage in bath tubs, pails or any other receptacles they have to carry them over until the next day's pumping period.

Sufficient water to supply the town of Moberly for 100 days more is held in its impounding reservoir, capable of containing enough water for a year. In order to provide for future emergency Moberly is installing an auxiliary well supply with a capacity of 200,000 gal. daily. Present consumption is at the average rate of 1 m.g.d.

Marceline, using just half as much water daily as Moberly, also has 100 days' supply left. No auxiliary supply is available to this town, however.

A set of special conditions has seriously affected the well supply of West Plains, down near the Arkansas border. The group of three wells supplying the town is located quite close to a narrow strip of vertically faulted rock lying in a north and south direction. Just over the state line, in Arkansas, this faulted strip is intersected by a similarly faulted strip running east and west. Mammoth Springs is formed at their junction. The faulted



Low water in the reservoir at Bloomington, Ind.
Present water level is 16 in. above the intake invert

material allows fairly easy passage for the water contained in the rock in the vicinity, and the groundwater level is normally considerably lower at the West Plains wells than would ordinarily be the case. When the rainfall shortage in this region had continued for a few months much of the available groundwater reserve had been drained to Mammoth Springs. Less than a month ago West Plains experienced difficulties in drawing sufficient water for its requirements. An acute shortage developed and lasted for a week, when upon the advice of the state geologist, the wells were deepened to bring the bottoms closer to the pool elevation of Mammoth Springs, 7 miles away. The remedy was successful, and the supply is now out of danger.

Increase in Typhoid Fever

Although it is difficult to obtain information as to the effect of the drought on the many private wells in the state, indications are fairly conclusive that many people have been forced to resort to auxiliary supplies, many of which are not entirely safe. Public health records show, for instance, that there has been a large increase in the typhoid death rate for the last six months of 1930 over the corresponding period of 1929. In the counties most severely affected by the drought this increase is even more pronounced. Undoubtedly this increase in the typhoid rate has decreased the physical resistance of the people as a large contributing factor, as it is apparent in

even the larger cities whose water supplies have been in no danger whatsoever. The greater tendency for an increased rate in the rural districts, however, and especially in the more severely affected counties, indicates the use of unsafe water supplies as an additional factor.

Conditions Better in Indiana

INDIANAPOLIS, IND.

Indiana has largely escaped any alarming water-supply deficiencies. There are only a few public supplies in the drought area dependent upon impounded surface water, and of these, three have caused varying degrees of concern. Experiences with well supplies here have been similar to those in other parts of the drought country. They have usually been unimpaired.

Like Illinois, Indiana's water supplies in the northern half of the state are drawn mostly from wells. Here, however, the wells do not go down to a deep water-bearing rock but draw largely on the water held by the sands and gravels comprising the deposits of glacial drift. Surface supplies are more in evidence in the southern part, but do not even there attain the frequency they do in the region west of the Wabash River.

Emergency infiltration and collecting pool at Bloomington
Water from a small brook is brought in by the flume at the right

Precipitation during 1930 averaged 29.70 in., compared with a normal of 39.29 in. As it was distributed rather uniformly throughout the state and the normal distribution is to increase toward the south, the deficiency in the southern counties was more pronounced than in the north. While the state as a whole received 76 per cent of its expected amount, south of Indianapolis the rainfall was somewhat less than 70 per cent. The drought began in March, following a wet January and a normal February. With the exception of September the deficiency has continued from March until the present time.

Consumption Reduced by Metering

Bloomington, the home of Indiana University, has three impounding reservoirs. The largest one, completed in 1924, is on Griffy Creek and has a capacity of 550 m.g. There is now available for draft only 16 m.g. In an effort to reduce the rate of demand below its value of 2.5 m.g.d. Bloomington in the summer began a program of completely metering the services. Although that program is still within 60 days of completion, the consumption has been reduced already to 1.5 m.g.d. In the middle of January an effort was made to develop a temporary supply of groundwater by constructing a trench sufficiently deep to intercept the water table and then pumping the water obtained into the Griffy Creek reservoir. But before the project was completed the appearance of the gravel in the excavation led to a reduction of the estimate of the quantity of water to be obtained by that means. The plan was then simplified to that of a deep pit where the line of the trench crossed a small brook. At present what flow exists in the brook discharges into the pit and, together with the groundwater that enters the bottom of the excavation, is pumped through a mile of 6-in. cast-iron pipe to discharge over the earth dam into the reservoir. It is estimated that 0.5 m.g. is pumped daily from this emergency supply.

A new impounding reservoir was completed last summer at the height of the drought at Batesville. The flow in Bob's Creek has been so far insufficient to fill the reservoir. The town's water demand depleted the reserve in its old impounded supply until there was an amount left good for only two or three days. An ice plant was then shut down completely, and other industrial uses were curtailed in an effort to save water. All arrangements had been completed to transport water in tank cars from the Ohio River at Aurora, just below Cincinnati, when the rains of September relieved the difficulties.

Milan has an impounded supply, untreated and used for fire protection and industrial purposes only, that became seriously depleted during the past summer. The supply is owned by the B.&O. Railroad, but watering of trains was discontinued so that the town could have the water.

Although as a rule well supplies have not been seriously affected, the wells in Salem went completely dry during last August, and the town was without fire protection for some weeks. The domestic demands were met by the discharge from springs. Strict rules against sprinkling were enforced, going so far as to impose a fine for violation.

Because of the decreased flow many streams are carrying heavy loads of sewage pollution. In all cases, however, water-purification plants are capable of making the water from such streams safe for drinking. Indiana's typhoid records shows no increase over previous years.

—F. W. H.

Spring-Seated Rails on Concrete Track

Concrete track construction with spring supports for the rails is being tried for a length of 345 ft. on the Austrian State Railways, as designed by the late Alfred Wirth of the railway staff. The concrete substructure somewhat resembles that of the Pere Marquette Railroad, described in *Engineering News-Record* of Feb. 27, 1930, p. 365, but the stringers or girders are independent instead of being on a common footing and are not connected by cross walls. Each stringer is 24 in. thick and 20 in. deep, with a 12-in. footing 28 in. wide. The top is not continuous but formed as a series of 12-in. blocks 28 in. c. to c. Each block is slotted to receive a U-shaped steel yoke 7½ in. deep, about 4½ in. wide and 11½ in. long, the top flanges resting on the concrete block and being secured by bolts. In the yoke are two helical springs having separate cap plates on which the rail rests, the rail base fitting closely in the top of the yoke. Angle tie bars placed under the rails at intervals are bolted to their flanges to hold them in line and gage. The maximum axle loads of 18 tons are said to cause very little deflection of the springs.

LETTERS TO THE EDITOR

A Forum for Expression of Views by Engineers and Contractors

✦

Farm Relief and Waterway

Sir—I was interested in the editorial (*Engineering News-Record*, Feb. 12, 1931, p. 204) headed "Threadbare Cant" and the prophecy, credited to the head of the farm board, that "grain exports are nearing their end."

Fifty years ago a certain C. Wood Davis, who was, or claimed to be, an expert, prophesied in a long and elaborate magazine article that it would be only a few years until the United States would be a wheat-importing instead of a wheat-exporting country. Similar predictions have been made many times since, invariably, I think by those who are opposed to the improvement of waterways. None of these past predictions have been fulfilled, and I am disposed to wait a little and see what happens to the present one.

The final sentence of your editorial seems to me to be entirely too broad and sweeping. You say that farm relief and waterway construction have no relation to each other. As I see it, the improvement of the Great Lakes and of ocean harbors has been of vast benefit to the country as a whole and to every class of our citizens, including farmers.

Possibly you meant only inland waterways, although no such limitation of meaning was expressed in the editorial. Even on that I take the liberty of differing with you. The building up of cities in the Middle West, every inhabitant of which is a consumer of farm products, certainly benefits the men who raise those products by bringing customers closer to their farms. A study of the maps and the census reports shows that the principal cities of the country are located on waterways, and the same thing is true in other countries as well. Since throughout the world the greatest centers of population and commerce and industry are invariably located on navigable water, I cannot escape the conclusion that the waterways had something to do with it.

A further improvement and utilization of waterways may not produce farm relief as quickly as a direct appropriation of cash from the treasury of the United States to supply food and clothing to those suffering from the effects of the drought, but I think it would be a much preferable method and the good results would be more lasting.

Washington, D. C.,
February 13, 1931.

S. A. THOMPSON,
Secretary National Rivers and Harbors Congress.

Corpus Christi Dam Failure

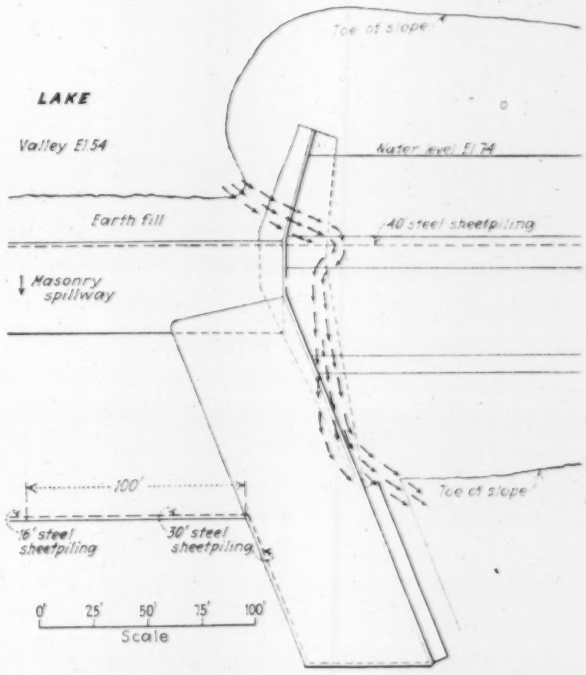
Sir—I have read with interest the account of the failure of the Corpus Christi dam, as given in *Engineering News-Record*, Dec. 18, 1930, p. 974. I was particularly impressed with the unusual features of the design of this dam when the account of its construction appeared in the issue of Oct. 2, 1930.

While I do not wish to anticipate in any way the report of the engineers who are inquiring into the failure, at the same time I feel that if any have theories to offer it is better to voice them than to keep silent. I therefore write the following in the hope that it may prove of some assistance in explaining a possible cause for the breaching of the dam.

The abutments were founded upon a number of wooden piles driven to practical refusal at 2½ to 3-ft. centers. From the valley section I note that the material beneath the north abutment is sand, then a layer of gravel, then more sand. As sand is virtually incompressible, the effect of driving these piles (from the account given of the construction I understand they were driven and not jetted) would be to loosen and lift the sand in the neighborhood of the piles for some little depth below the surface. When the abutment concrete was poured, this sand was probably sufficiently firm to support the initial weight of concrete without appreciable settlement. Later, of course, all the load would be transferred to the piles.

When, however, the reservoir was full and the sand became saturated, a slight settlement and repacking of the sand would slowly take place, and this, aided also by the shrinkage of the concrete, would result in a shallow cavity between the ground and the concrete, extending probably over the whole of the area of the abutment footing. (It is assumed that the piles, having been driven to practical refusal, would support the whole weight of the abutment without settlement.) This space, though perhaps only a fraction of an inch in depth, would afford a comparatively easy route for the flow of water to the heart of the dam, and, the water, having once passed over the sheetpiling in the embankment section, would also provide an easy means of exit to the downstream toe.

The shortest distance from the toe of the upstream slope to the edge of the abutment footing is only about 14 ft.



Probable course of water under Corpus Christi dam

This distance would offer no serious obstacle to percolation, and I suggest that it is at this point that the flow through the dam made its start. The evidence of the stain on the back of the weir wall—if this can be admitted as evidence—would seem to support this argument. I append a sketch which shows by the arrows the path which I suggest may have been the initial route of the water through the dam.

As to why the failure occurred at the north abutment and not at the south; some reason for this may be found in the remedial measures which were taken to repair the damage done to the south abutment by the flood which occurred during construction.

A. K. POLLOCK,
Chartered Civil Engineer.

Nottingham, Kent, England.
Jan. 23, 1931.

Motor Vehicle Accident Rate Increases

Sir—As a matter of information and not a criticism, permit me to correct the editorial statement near the bottom of p. 220 of your Feb. 5 issue that the motor vehicle accident rate "seems to be decreasing but very slowly." This statement may have been based on U. S. Census Bureau releases covering the reports from large cities and showing practically no change, even perhaps a small decrease, in 1930 compared with 1929.

Unfortunately, the rural states have a considerable increase. Our careful survey of preliminary data from 34 states, including three-fourths of the population of the country, indicated that in the states having more than 60 per

cent urban population there was practically no change in motor vehicle deaths from 1929; in states more than 60 per cent rural there was a 14 per cent increase; in the remaining states there was an average of 7 per cent increase. As the urban states have the greater population, the total national increase was probably about 4 per cent, making an estimated 1930 total of 32,500 deaths, as compared with 31,215 in 1929. This includes collisions of automobiles with railroad trains and street cars as well as collisions with other vehicles, fixed objects and pedestrian accidents.

As the registration of motor vehicles increased only a small fraction of 1 per cent in 1930 the automobile death rate *per 1,000 vehicles* increased by nearly 4 per cent. The percentage increase in terms of population was smaller than the previous year, but the increase in terms of vehicles was fully as great as ever before.

The concluding sentence of the editorial, that the driver license states show up best, is quite true. We are strenuously advocating the legislation in the other states, as well as continuation of the educational and engineering measures which have been found effective in reducing accidents.

Chicago, Ill., Feb. 12, 1931. SIDNEY J. WILLIAMS, Director Public Safety Division, National Safety Council.

The true measure of accident occurrence in highway travel is the passenger mile. No statistics of passenger mileage exist, but gasoline tax income is an indicative measure of car mileage, and this appears to have increased a greater percentage in 1930 than did registration or accidents to passengers. This assumption was the basis of the conclusion to which our correspondent takes exception. —EDITOR.

World's Largest Dry Dock

Sir—I should like to draw your attention to a paragraph in the Dec. 18 issue of *Engineering News-Record*. Under the heading "World's Largest Graving Dock for Southampton" is the statement that "The world's largest graving dock at present is at Boston, where the U. S. Navy Department owns the Commonwealth dry dock."

As a subscriber to your publication, I have noted the invariable accuracy of your information, and so I am sure the following comparative data on the dry docks at Saint John, N. B. (Canada), and Boston will interest you.

	SAINT JOHN N. B.	BOSTON
Over-all length, ft.	1,225	1,200
Length on keel blocks, ft.	1,150	1,171
Width at top, ft	133	.....
Width at bottom, ft.	125	120
Depth of water over sill at high tide, ft.	42	46

You will note that this privately owned dock can accommodate larger vessels than the Commonwealth dock at Boston and can, therefore, lay claim to being a larger dock. Incidentally, it is the largest graving dock in the British Empire.

Saint John, N. B., Jan. 6, 1931. S. HOGG, Structural Steel Dept., St. John Dry Dock & Shipbuilding Co., Ltd.

Too Much Dependence on Models

Sir—In your issue of Nov. 27 there is an interesting article about the rigid rectangular-frame foundation used for the new Albany telephone building. In a reference to the analysis there is this significant statement: "The indeterminate character of the structure, particularly because of its two-story construction and the involved mathematical analysis necessary for its design, together with the possible inaccuracy of such an analysis, caused the designing engineers to resort to the use of elastic models to determine the stresses in the structure." An editorial in the same issue states, "The ingenuity of the conception is well matched by the effectiveness of the method by which the structure was analyzed."

The writer has no quarrel with the structure. The rigid-frame foundation is a good solution for the set of conditions encountered at Albany. But he marvels at the naïve faith in "model analysis," the willingness to accept it in lieu of a mathematical analysis, which for a structure like this is a rather simple procedure and not at all involved. There is some value in studying models of complex structures. Good check results have been obtained by their use, but it must be remembered that the true function of model analysis is to supplement mathematical computations, not to supplant them. It is rather surprising to hear that results obtained from the scaled physical deformations of a small scale model, which cannot exactly reproduce the elastic properties of the original structure and which is quite susceptible to other influences than that of the deformeter gage, are considered more dependable than algebraic results. The writer has taken the same structure and analyzed it by the "moment distribution method" developed by Prof. Hardy Cross, of the University of Illinois, and presented in *Proceedings*, Am. Soc.C.E., May, 1930, and *Proceedings*, American Concrete Institute, Vol. 25, 1929. Once familiar with this method, there is no need to remember any cumbersome formulas, for the beauty of it lies in the ease with which the physical response of the structure to a load condition is pictured at the same time it is being evaluated. Moreover, it is a very rapid method.

New York City, Jan. 21, 1931. H. E. WESSMAN, Structural Engineer, Waddell & Hardesty.

Progress in Industry Again

Sir—Under the above caption in your issue of Jan. 29 a correspondent asks for discussion of the age-old controversy of hand versus machine production.

Progress requires that production shall increase more rapidly than population. Otherwise poverty must increase, because our present per capita production is only $750 a year. It is primarily through machine production that per capita production is increased. Increased per capita production provides more for each consumer if it is properly distributed. The poor are receiving proportionally more of the increase in production than the rich. (King's "The National Income," 1930, p. 174.)

Machine production therefore tends to raise wages in the United States, since there is more to be divided, and the division tends to favor the wage earner. In fact wages for common labor have risen threefold since 1900; there has been some increase in prices but nothing corresponding to this increase in wages.

When wages are rising, employment is at a premium and there is a job available for every worker if he can but adapt himself to it. Jobs are then increasing faster than population. From 1870 to 1920 the number of jobs filled by urban workers increased approximately twice as fast as population. (Bulletin 65, Women's Bureau, U. S. Dept. of Labor.)

The normal condition under increased machine production would be characterized by rising wages and falling prices. This was the condition through most of the period from 1925 to midsummer of 1929. And we have by no means reached the summit of desirable machine production. The objections raised against it now have been the same for more than a century past.

Machine production therefore would solve unemployment were it not for the obstacles that are placed in its way. Of the 10,000 laws passed in the United States every two years a large percentage have for their purpose the curbing of business enterprise. Since it is business enterprise that provides employment it is little wonder that unemployment exists.

The present depression is an exception to the normal condition outlined above but is not due to machine production. The business curve oscillated through a dozen minor depressions from 1925 to 1929 before the final downward trend of July, 1929. The variations were not 5 per cent from normal up to that time. Then a policy of business planning was inaugurated that converted what might have been a minor depression into a major calamity with a downward variation of more than 25 per cent. One effect of a business depression seems to be to encourage savings. When the accumulation of savings has been sufficient, the curve will probably turn upwards, if indeed it has not already done so.

Indianapolis, Ind., Feb. 12, 1931. DANIEL B. LUTEN.

NEWS OF THE WEEK

$48,890,999 Low Bid For Construction of Boulder Canyon Dam

A BID of $48,890,999 by the Six Companies, Inc., for the construction of Hoover Dam on the Colorado River was found to be the low figure when the bids were opened at Denver on March 4. Other bids were: Arundel - Atkinson, $53,893,878; and Woods Brothers Const. Co., $58,653,-107. There were three other irregular bids. The low bid is stated to be within $200,000 of the estimate of the engineers of the Bureau of Reclamation.

The Six Companies, Inc., is made up of the Utah Construction Co.; McDonald & Kahn; Morrison-Knudsen; J. F. Shea & Co.; Pacific Bridge Co.; and Henry J. Kaiser and W. A. Bechtel. S. T. Crowe, formerly an engineer with the Bureau of Reclamation, is manager of the Six Companies, Inc.

These statements are subject to correction as they were obtained by long-distance telephone from Denver in order to get them in this issue.

Chicago Authorizes $54,600,000 in Bond Issues

All the thirteen bond issues voted upon at the Chicago election on Feb. 25 were carried by considerable majorities. One was submitted by the city for $2,500,000 for widening North State St., to permit construction of the proposed subway. The Sanitary District had four propositions totaling $36,000,000 for sewers and sewage-works; $20,300,000 for the Calumet works, $11,000,000 for the West Side works, $3,100,000 for the Southwest Side works, and $1,600,000, for enlarging the North Side works. The South Park Commission had seven propositions totaling $13,100,000 for boulevards, Randolph St. viaduct, shore protection and park improvements. The Lincoln Park Commission had only one proposition, $3,000,000 for park extension and improvement.

Injunction Removed Against New York Steel Erectors

An injunction obtained by the International Association of Bridge, Structural and Ornamental Iron Workers restraining the Structural Steel Board of Trade, New York, from employing other than union labor was reversed Feb. 27 by the Appellate Division of the New York Supreme Court. The injunction had been granted Jan. 3, 1931, by Justice Black, of the supreme court, pending action on a suit argued Dec. 11, 1930, in which the union ask $3,500,000 from the board, alleging violation of a contract dated May 12, 1930. (*Engineering News-Record*, Jan. 8, 1931, p. 85 and Nov. 27, 1930, p. 866.) In reversing the injunction the Appellate Division contends that no contract exists. The contract in question provides that the eighteen contracting firms, members of the Structural Steel Board, use union labor only, after 25 years of open-shop work.

New Hudson River Tunnel Authorized

Port Authority to operate Holland tunnel and existing bridges and construct midtown vehicular tube

TWO bills authorizing the construction of a midtown Hudson River vehicular tunnel between New York and New Jersey and enlarging the powers of the Port of New York Authority have been passed by the legislatures of the two states. The bills have been signed by the New Jersey governor, and Governor Roosevelt, of New York, is expected to approve them soon.

One measure declares the policy of the states of New York and New Jersey in regard to vehicular bridges and tunnels within the port of New York district, vests the control and operation of the Holland tunnel in the Port Authority, authorizes the Authority to construct the midtown tunnel and regulates the construction and operation of bridges and tunnels by the Authority. The second measure regulates the use of revenues received by the Port Authority from the operation of terminal and transportation facilities.

The construction and operation of vehicular bridges and tunnels between the two states until recently have been designated to two separate agencies, the Port of New York Authority and a bridge and tunnel commission in each state. The Port Authority was established in 1921 by a contract between New York and New Jersey to

GATES CLOSED ON BAGNELL DAM, OSAGE RIVER, MISSOURI

Construction work on the gravity-section concrete dam being built across the Osage River near Bagnell, Mo., has reached a stage permitting the closing of the gates to start impounding water in the reservoir. The reservoir, when full, will be 130 miles long and will have a surface area of 95 square miles, and allowing a draw-down of 30 ft., will provide a storage capacity of 1,200,000 acre-ft. The dam is 2,543 ft. long and reaches a maximum height of 148 ft. above foundations. Initial installation of power units includes six 33,500-hp. turbines operating under a 90-ft. head. Provision is made for two additional units. A feature of the power house design is the elimination of superstructure above the generating room floor. The Stone & Webster Engineering Corporation designed and built the project for the Union Electric Light & Power Co.

execute a comprehensive plan for the development of the freight transportation facilities of the port. Beginning in 1924 and thereafter its jurisdiction was enlarged to include the construction of three highway bridges from Staten Island to New Jersey and the Hudson River bridge between Fort Washington, New York City, and Fort Lee, N. J. All of these projects were financed by Port Authority bond issues secured by the tolls of the particular projects, together with funds advanced by the two states, which are also to be repaid out of tolls.

The bridge and tunnel commissions were created in 1906 to investigate the feasibility of constructing a bridge over the Hudson River between the two states. In 1913 these commissions were directed to consider the possibilities of vehicular tunnel construction, and in 1919 were authorized to proceed with the construction of a vehicular tunnel under the Hudson River between Canal St., Manhattan, and Jersey City. These commissions constructed the Holland tunnel, now in operation between Manhattan and Jersey City. The cost of this project was met by advances from New York made from current funds, and from New Jersey by bond issues.

Tunnel Authorized

The recently passed bills include definite authorization for the midtown Hudson tunnel from a point between West 35th St. and West 41st St. west of Ninth Ave., Manhattan, to Weehawken and Homestead, N. J., at a cost estimated at $96,000,000; refunding of the Holland tunnel debt; provision for unified operation of all interstate vehicular facilities in the port district, and regulation of the use of Port Authority surplus revenues.

One of the laws declares the policy of New York and New Jersey to treat as a single problem provision of all facilities for interstate highway traffic within the port district. To that end all existing and future crossings are to be under the unified operation and control of the reorganized Port Authority. The money payable to each state (estimated at $24,000,000) will go into the treasury in New York and in New Jersey will be paid into the sinking fund against bonds issued for tunnel construction.

Disposal of Surplus Funds

It was evident in planning this program that the Port Authority would in time come into possession of surplus revenues resulting from the operation of its facilities, over and above the amounts which it was required by the terms of its various bond issues to allocate to operation, interest and amortization. The second law, threrefore, provides that this surplus money shall be put into a common surplus reserve fund to be used as additional security for the bonds that may have been issued against the projects and provides that it cannot be used for any other projects except under authorization by the legislatures of New York and New Jersey.

General Jadwin Dies Suddenly in Panama of Cerebral Hemorrhage

EDGAR JADWIN, lieutenant-general (retired) and former Chief of Engineers, U. S. Army, died of a cerebral hemorrhage in Gorgas Hospital in the Panama Canal Zone on March 2. General Jadwin arrived in Panama City on Feb. 25 in connection with the investigation in regard to the advisability of constructing a canal across Nicaragua

Lieut. Gen. Edgar Jadwin

or increasing the capacity of the Panama Canal.

General Jadwin was born in Honesdale, Pa., Aug. 7, 1865, was educated there and at Lafayette College, and upon graduation from Lafayette College went to the U. S. Military Academy. Upon graduation from West Point at the head of his class General Jadwin (then a lieutenant) was assigned to the Corps of Engineers, where he served on river and harbor work until in 1908 he went to the Panama Canal as division engineer on the Chagres division.

During the Spanish-American War General Jadwin served as a lieutenant colonel of the 3rd U. S. Volunteer Engineers, and commanded the U. S. troops marching into Matanzas, Cuba, on the occasion of the transfer of sovereignty.

He went to France in 1917 in command of the 15th Engineers, and within a short time was promoted to the rank of brigadier general and appointed chief engineer of the advance section, line of communication. Subsequently he was appointed director of the division of construction and forestry, and then director of light railways and roads. He was awarded the Distinguished Service Medal for this service.

General Jadwin was a Companion of the Order of the Bath (British), and a Commander of the Legion of Honor (French). In 1919 he served as a member of the American mission to Poland and an observer in the Ukraine.

After his return to the United States he served successively as engineer of the 8th Corps Area and division engineer, Southeast Division, on river and harbor work, until his appointment, June 19, 1924, as Assistant Chief of Engineers. In June, 1926, he was appointed Chief of Engineers.

In 1927 and 1928 following the disastrous floods of 1927 in the Mississippi Valley when Congress undertook to develop a plan for flood relief in the lower valley there arose a difference of opinion as to how the work should be carried out. The Mississippi River Commission prepared one plan and the army engineers under General Jadwin's direction prepared another. The plan prepared by the army engineers under General Jadwin was finally approved by Congress in June, 1928.

In August, 1929, General Jadwin, having reached the retirement age, was retired with the rank of lieutenant general. His activities, however, did not cease, for he served on the advisory board of the St. Lawrence Power Development Commission, was chairman of the reorganized Federal Power Commission and was consulting engineer to the Meadows Reclamation Commission which put before the New Jersey legislature only a few weeks ago a 50-year plan involving the expenditure of $500,000,000. He was also chairman of the Interoceanic Canal Board, for which work he was in the Canal Zone at the time of his death.

Arkansas Engineers Club Holds Annual Meeting

The sixth annual meeting of the Arkansas Engineers Club was held Feb. 20 and 21, at Little Rock, Ark., with more than 150 members in attendance. L. W. Wallace, secretary of American Engineering Council, Washington, D. C., spoke of the engineer's place in the economic structure of the country and discussed the work of the Council. W. L. Winters, consulting engineer, of Fort Smith, Ark., discussed the trend in engineering practice and commented on the future outlook. The place of the engineer in community planning and building was discussed by Justin Matthews, member of the Arkansas state highway commission. Wallace Townsend, U. S. district attorney, Little Rock, spoke on the intricacies of improvement district financing and the cooperative work of the engineer and the attorney in such matters. Frank V. Ragsdale, Memphis, Tenn., engineer, talked on cooperation and opportunities for mutual help among contractors.

The club adopted a resolution asking Governor Parnell to appoint an engineers' committee to represent the state in flood-control discussions.

Officers for the coming year were elected as follows: president, R. S. Lander, Little Rock; vice-president, W. T. Barry, Fort Smith, secretary-treasurer, W. Terry Feild, Little Rock; steward, John Eakin.

New Joint Concrete Committee Resumes Specification Study

Developments in the field of concrete and reinforced concrete since 1924, when the last joint committee disbanded, have led to the formation of a new joint committee to consider needed specification changes. This new committee, made up, as were its predecessors of 1921 and 1924, of five representative each of the Am.Soc.C.E., A.S.T.M., A.R.E.A., A.C.I. and Portland Cement Association, met in Chicago Feb. 27 and 28. Several plans for future work were agreed upon, and the next meeting was set for June 22-23, also in Chicago.

Among the developments that will receive the committee's attention are changes in cement, the use of ready-mixed concrete, the increased understanding of design of mixtures, the tendency toward rigid-frame construction and the increased attention being given to field control. In addition a general study of the 1924 report will be made with a view to improving its presentation and widening its scope.

The committee proposes in its report to separate specification clauses from those which have more of the nature of recommended practice. It is planned also to add as an appendix the technical data upon which the recommendations of the report are based. The committee is considering the necessity of distinguishing between the requirements for so-called outdoor concrete and those for concrete in locations, such as heated buildings, that are not exposed to the effect of weather. Watertightness as an element of durability will be recognized as one of the essentials of concrete for outdoor exposure. The necessity for this has been brought about by the recent development of generally higher strengths in portland cements. Following the practice which has become quite general of designing concrete for a given strength requirement, it is possible with these newer cements that mixtures will result which are too lean for proper durability. Some limitation will therefore be placed upon the cement content to avoid this difficulty.

In the field of design of reinforced concrete, the committee proposes to present the recommendations in regard to moment coefficients by putting primary emphasis on the general case of unequal spans, thus reversing the arrangement in the 1924 report in which the emphasis is placed on a series of equal spans. Moment coefficients will be given only for the case of equal spans, and these will be presented with separate coefficients for live and dead load. The joint committee consists of:

A.C.I.—S. C. Hollister (ch.), J. G. Ahlers, F. H. Jackson, B. Moreel, N. M. Stineman.

A.R.E.A.—C. P. Richardson (ch.), M. Hirschthal, J. B. Hunley, A. R. Ketterson, J. F. Leonard.

A.S.C.E.—W. A. Slater (ch.), M. N. Clair, A. E. Lindau, F. E. Richart, W. S. Thomson.

A.S.T.M.—C. M. Chapman (ch.), P. H. Bates, A. T. Goldbeck, E. E. Hughes, L. S. Moisseiff.

P.C.A.—F. R. McMillan (ch.), D. A. Abrams, Ernest Ashton, J. H. Chubb, H. G. Farmer.

Chief of Engineers Proposes No Major Change in Flood Plan

NO MAJOR changes in the Jadwin plan for the control of floods along the lower Mississippi River are recommended by Major Gen. Lytle Brown, Chief of Engineers, U. S. Army, in a report submitted to Congress on March 3. The report was made at the request of the House committee on flood control because of questions raised in recent months as to the advisability of carrying out the plan as adopted May 28, 1928.

The Chief of Engineers recommends as follows:

Recommendations

1. That the general method for the control of floods of the lower Mississippi River be as now adopted.

2. That the adjustment of the equities of protection and lack of protection be left to those who alone can apply economically the benefits derived to such purpose—namely, the states and other local governmental agencies.

3. That the project be stated more definitely, but left with all the flexibility possible.

In the restatement General Brown recommends a definite pronouncement that the waters of extreme floods shall be allowed to escape from the main river through natural outlets to the Gulf of Mexico and that in these areas only such protection works shall be built as are requested by local interests and are found economical. Further, no protection works either on the main river or on its tributaries should be built in any state until such state by legislative action shall have protected the United States against all claims on account of flood damage.

A definite statement that local interests shall provide rights-of-way and flowage rights except in the Bonnet Carré and Birds Point-New Madrid floodways also is proposed. The cost of emergency crossings by highways and railways should be borne by local interests, according to General Brown, except in the Bonnet Carré floodway, where such crossings as the secretary of war deems necessary shall be built and maintained by the federal government.

Flood Damages

In his report General Brown states that the crux of the objection to the existing project is that all local interests are not given equal benefits and that no general provision is made to equalize benefits by the payment of damage due to flood. He believes that unless the federal government is divorced by law from the payment of flood damages and flowage rights the economic foundation of the whole project will be sapped.

Reservoirs Opposed

While it can be shown that it is possible to reduce flood heights somewhat by the use of reservoirs, especially on the Red River, the cost of such reservoirs is so great as to put them beyond consideration. Backwater areas can be used to some extent for such purposes if provision is made for maintaining them in an undeveloped state, which does not appear likely, but they are not found to be necessary with adequate floodways.

Fuse-Plug Levees

The so-called fuse-plug levees at the head of the floodways are a cause of so much local concern that General Brown recommends the substitution of fixed weirs if economic justification for the expenditure can be found. Further, General Brown believes that floodways narrower than those proposed in the Boeuf and Atchafalaya valleys, with fixed weirs somewhat lower than now proposed, will be the ultimate solution of that feature.

Construction Men Participate in New York Safety Conference

A construction session and dinner ended the second annual Greater New York Safety Conference held in New York City Feb. 25 under the auspices of the Metropolitan chapter of the American Society of Safety Engineers. Three talks expressing widely differing viewpoints and an interesting general discussion of safety work featured the construction session. Charles Denning, of the New York state department of labor, told of the duties of the state inspectors on construction projects and the problems encountered by them.

Safety starts with buying equipment, declared J. W. Bowser, superintendent for Starrett Bros. & Eken on the Empire State Building. The next step is to put someone in charge of safety work and make him responsible for safeguards.

John Russell, Jr., safety engineer, United Engineers and Constructors, Inc., Newark, N. J., outlined the duties and possibilities of the safety engineer on construction work.

Henry W. Lohmann, vice-president, James Stewart & Co. and chairman of the committee on accident prevention of the New York Building Trades Employers Association, presided at the construction session.

Pennsylvania R.R. to Expedite $175,000,000 Improvements

Completion within 2½ years instead of four years of the extensive program of improvements begun by the Pennsylvania R.R. a little more than a year ago has been announced by President Atterbury. These plans call for a total expenditure of $175,000,000, and in view of the fact that commodity prices are now at a low level and the efficiency of labor is high, the time has been deemed exceptionally favorable to push the plans to conclusion.

American Engineer to Make City Plan for Bogota, Colombia

Harland Bartholomew, engineer for the St. Louis (Mo.) City Plan Commission and president of the American City Planning Institute has been retained by the city of Bogota, Colombia, South America, to perfect a complete city plan for that city. Mr. Bartholomew has prepared plans for a number of American and Canadian cities. It is expected that the work in Bogota will require about two years to complete. It will involve planning streets and highways to afford maximum convenience and beauty, groupings of public buildings and a system of parks.

J. E. Cashman, Pioneer Member of the A.G.C., Dies

James E. Cashman, nationally prominent general contractor, died of heart failure on Feb. 24 at his home in Burlington, Vt., following a minor operation for a staphylococcus infection on the back of his neck.

Mr. Cashman was widely known among contractors for his consistent support of the idea of a unified national organization of general contractors. He was a pioneer member of the Associated General Contractors, serving as vice-president at large in 1930 and as chairman of the membership committee since 1926. Since the early days of the association he had attended every convention and executive board meeting of the organization. He recently returned from the annual convention of the association in San Francisco, where he was awarded a national safety contest trophy for his firm's record of no accidents in 211,926 hours worked during 1930. At that convention Mr. Cashman was also appointed an alternate member of the president's cabinet and executive committee.

Following the disastrous New England floods in 1928 Mr. Cashman headed the relief construction operations in the Vermont district and succeeded in opening up train operation to many stricken Vermont cities. Early in his career Mr. Cashman installed the water system of Ipswich, Mass., and the sewage pumping station at Quincy, Mass. He acted as superintendent on the construction of bridges for the Old Colony Railroad; on the construction of the river wall at Worcester, Mass., for the Metropolitan Park Commission of Massachusetts; and in rebuilding the South Boston yards of the New York, New Haven & Hartford Railroad. Since 1903 he had been engaged in the private practice of engineering and contracting, especially on waterfront improvements and submarine work of all descriptions along the New England coast and Lake Champlain.

Bids Asked on Coldbrook-Swift Water Tunnel

Close on the heels of the U. S. Supreme Court decision upholding the diversion of tributaries of the Connecticut River to supplement the water supply of Boston and vicinity (see p. 399 of this issue) the Metropolitan District Water Supply Commission decided to receive bids on March 27 for the Coldbrook-Swift aqueduct-tunnel. Like the Wachusett-Coldbrook division, just completed, of which the new tunnel will be an extension from the Ware to the Swift River, the work now advertised will be a concrete-lined tunnel of horseshoe section, with inside height of 12¾ ft. and width of 11 ft. There will be four working shafts—100, 200, 300 and 400 ft. deep, respectively.

The tunnel already completed is 14.2 miles long, making the total length from the Swift River to the Wachusett reservoir 24.6 miles. Ultimately the new tunnel will carry water from a large storage reservoir on the Swift. The latter will not be built in the immediate future, as about four years will be required to build the Coldbrook-Swift tunnel, after which it will be sufficient for a time to take flood flows only from the Swift, as the already-completed section will do from the Ware.

To form the Swift River reservoir, two dams of about the same dimensions will be constructed, each about 0.5 mile long and some 260 ft. in extreme height, half above the stream, half extending from there to rock. Possibly some river-control work at the site of the main dam will be done this year. The flow line of the Swift reservoir has not yet been fixed, but probably the reservoir will have a capacity of from 300 to 400 billion gallons.

Frank E. Winsor, Boston, is chief engineer of the Metropolitan District Water Supply Commission.

Meeting of Indiana Section, A.W.W.A.

Drought situation, water softening and purifying and water-works losses among the matters discussed

THE 24th annual meeting of the Indiana Section, American Water Works Association, was held at Indianapolis Feb. 26 and 27 with an unusually large attendance, the sessions averaging 200 persons. George H. Fenkell, president of the A.W.W.A., was present and addressed the luncheon group of the first day.

A symposium on the drought of 1930-31 emphasized the fact that the low rainfall period continues and that groundwater supplies may be expected to grow increasingly inadequate. The normal seasonal upturn in streamflow has not occurred, although the probabilities are against much further continuation of this situation. F. H. Waring, chief engineer, Ohio state board of health, pointed out that cities in that state using surface supplies have suffered from increased mineralization and taste problems. The excess lime treatment, where it could be applied, has alleviated tastes. The ammonia-chlorine treatment has eliminated phenol tastes but not a so-called "river" taste. Activated carbon in powdered form has been used successfully at Huntington, W. Va. The material at a rate of 3 grain per gallon was applied by dry feed machines. The cost averaged $4 per million gallons.

Water Softening and Purifying

The basic considerations of the design of the projected water-softening plant for Fort Wayne, Ind., were presented by R. L. McNamee, consulting engineer, and Mayor W. H. Hosea. The completion of this work will make it possible to place on a stand-by basis the present inadequate and very hard water supply of Fort Wayne and furnish an adequate and soft water at a reasonably increased rate.

The successful use of ammonium sulphate in the ammonia-chlorine treatment was detailed by H. E. Jordan, of the Indianapolis Water Co. The cost of the treatment is less than when anhydrous ammonia is used, and the efficiencies are equal. Commercial sulphate contains 25.5 per cent NH_3, 0.5 per cent moisture and an impurity of 0.003 per cent phenol. This latter material does not adversely affect the process. Since the use of sulphate was begun at Indianapolis in October, its use has spread to other cities. Among these is Detroit, where the results have been strikingly satisfactory.

The new Kokomo iron-removal plant was described by F. P. Stradling, manager. The 3-m.g.d. layout consists of coke tray aerators with rapid sand filters. With accessory equipment the cost was $17,000 per million gallons.

Avoidable Water-Works Losses

A symposium on "Avoidable Water-Works Losses" was led by F. C. Jordan, of the Indianapolis Water Co. H. S. Morse, general manager, Indianapolis Water Co., presented a preliminary set-up of "A Rating Scale of the Factors Contributing to Satisfactory Public Relations." This related to the new edition of the A.W.W.A. manual and presented, in form comparable to the method used by the National Board of Fire Underwriters, a rating form to evaluate the public relations of a water utility.

The final session was a symposium on "Unemployment" led by Dr. J. H. Hewitt, secretary, Indiana Unemployment Commission.

A filter plant operators' school was held on the second day of the meeting, with a plant practice session at the filter plant of the Indianapolis Water Co. in

the morning and a laboratory session at the state board of health in the afternoon. Forty attended. Resolutions were adopted indorsing the state board of health legislative program for an improved stream-pollution law, a full-time health officer law and emergency legislation for medical and nursing service in the drought areas of the state.

Officers were elected as follows: president, L. S. Finch, chief engineer, Indiana state board of health, Indianapolis, Ind.; vice-president, F. P. Stradling, manager, Kokomo Water Works Co., Kokomo, Ind.; secretary, C. K. Calvert, chief sanitary engineer, Sanitary District, Indianapolis, Ind.; assistant secretary, William Luscombe, manager, Gary Water Co., Gary, Ind.; director A.W.W.A., Harry E. Jordan, filtration engineer, Indianapolis Water Co., Indianapolis, Ind.

Problems Discussed by Wisconsin Engineers

Technical and economic subjects, registration bills and surveying problems receive attention at annual meeting in Madison

ECONOMIES in water supply and concrete mixing, local registration law progress and surveyors' difficulties were included in the program of the annual meeting of the Engineering Society of Wisconsin, held at Madison, Feb. 18 to 20. The present industrial depression was reviewed by Glenn Frank, president of the University of Wisconsin.

Efforts of a joint committee to prepare a bill for the registration of engineers in Wisconsin were described by T. Chalkley Hatton, Milwaukee. The architects, who already have a registration law, agreed to a bill that would cover both engineers and architects, but opposition developed from the mechanical and electrical engineers. The architects then prepared a bill for the modification of their existing bill and the civil engineers are trying to come in with the architects on this as a joint bill. Prof. John S. Dodds, of Iowa State College, explained the operation of the registration law in Iowa.

Substantial economies obtained through the elevated storage of water were described by E. F. Tanghe, engineer in the Milwaukee water department. Complaints of low pressure during sprinkling hours in an outlying district led to the erection of an elevated storage tank that rides on the mains only in the evening; it is put on about 5 p.m. through a time control and stays on during the peak demand and until it has refilled with water during the night.

Special Methods of Mixing Concrete

Special methods of mixing concrete that resulted in saving $25,000 in one year in highway construction in Sheboygan County, as explained by George Langley, Jr., county highway engineer, included separating and recombining the gravel aggregate, charging mixers to the limit of their efficiency and reducing the mixing time to 50 seconds, which gives strength results practically the same as with 60 seconds. He claimed that a mixer of 27 cu.ft. manufacturers' rating may be charged to 35 cu.ft., with resulting economy and no loss in strength of concrete. The saving amounted to 6½c. per square yard of paving by grading the gravel and 5½c. by full charging of the mixers, with a total saving of $1,400 per mile.

A special day for surveyors was a feature of the meeting, with a program planned to secure informal discussion. Prof. R. S. Owen, University of Wisconsin, outlined investigations by Aubrey Wagner, a student in civil engineering, as to the actual position of the fourth principal meridian, which passes through Wisconsin. The original survey was made under difficult conditions and recent observations indicate that it departs from correct position by 1,900 ft. in some places. The surveyor on the witness stand, as discussed by Adolph Kanneberg, Wisconsin railroad commission, must know and conform to the law covering his work; his testimony will not carry conviction if he overstates his points or submits records and plans that are not accurate and complete. Failure of the state highway commission to preserve section corners and mark them in the concrete pavement was criticised. Land monuments and the relative merits of concrete and iron markers received much discussion, and Professor Owen referred to a radio device for detecting buried iron stakes.

Other Subjects Discussed

Other subjects included the effect of technical changes on unemployment by Prof. D. D. Lescohier; short haul transportation, by A. R. McDonald, Wisconsin railroad commission; developments in timber framing, by George Trayer, Forest Products Laboratory; the understressing of cast iron and steel, by Prof. J. B. Kommers; the proposed condemnation and benefit assessment law, by Mark A. Kline, assistant city attorney of Milwaukee; grade separation, by Lieutenant-Governor Huber, and natural-gas distribution, by Prof. O. L. Kowalke.

Water supply of Athens, Greece, and railway construction in Persia were the subjects of a talk by G. E. Hines, of the Ulen company, at the annual dinner, held jointly with the Technical Club of Madison.

Officers Elected

Officers for 1931 include: president, Walter A. Peirce, manager of water department, Racine, Wis.; vice-president, H. C. Webster, Milwaukee; secretary (reelected), Prof. R. S. Owen, University of Wisconsin, Madison, Wis.

More Than 100 Engineers Seek Maryland Position

More than 100 engineers from all parts of the country have sent notice to the Maryland state employment commissioner, Baltimore, that they will take an examination for appointment as chief engineer of the Maryland Public Service Commission. The place has been vacant since June, 1929, when H. Carl Wolf resigned. Since that time Luke Ellis, senior engineer of the commission's staff, has been acting chief engineer. The state employment commission has not set the date for the examination.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

President Signs Davis-Bacon Bill to Maintain Local Wage Rates by Contractors on U. S. Buildings

WITHOUT a record vote, the House on Feb. 27 passed the Davis-Bacon bill requiring contractors on federal buildings to maintain local wage rates. Under suspension of the rules, the Senate bill was substituted for the House bill to expedite transmission of the legislation to the President, who signed the measure on March 3. No amendment was offered. During discussion it was brought out that arguments had been advanced by a group of contractors for an amendment requiring that the prevailing wage rate in a community be determined in advance by the department in charge of the work. Such an amendment was not considered, however, because it was felt that any change in the Senate language would endanger the final passage of the measure. As the legislation now stands, every federal building contract over $5,000 must call for the preservation of local wage rates. In cases of dispute, the secretary of labor will determine the prevailing rate. Representative Bacon, of New York, co-author of the bill, stated that he had received letters from the Thompson-Starrett Co., the George A. Fuller Co. and other construction companies indorsing the measure.

Barge Line Service for Illinois River

A certificate of public convenience and necessity permitting the government barge line to extend its service up the Illinois River as far as Peoria was issued by the Interstate Commerce Commission on Feb. 26. The commission also orders the railroads in the territory affected by the service to join with the barge line in establishing joint rail and water rates between points on the Illinois River and New Orleans and other cities on the Mississippi. According to war department plans, the barge service up the Illinois will be started on July 1. A water-and-rail terminal under construction at Peoria is expected to be completed by that time.

Brief News

A VEHICULAR BRIDGE across the Mohawk River between Cohoes and Waterford has been authorized by the legislature of New York and $200,000 has been appropriated to pay for the state's share of the cost.

WORK HAS BEEN STARTED on the new $1,500,000 post office and federal building in Oakland, Calif., on a site at Twelfth, Thirteenth, Alice and Jackson Sts. The first contract was let to George Peterson, San Leandro, Calif., for the excavating and foundation work. Before this work is completed the plans will be ready and the contract awarded for the superstructure.

BUILDERS OF HIGHWAYS and bridges who served during the World War in the 23d Engineers will hold their first national reunion March 19 and 20 in the Hotel Astor, New York City. This regiment of 4,880 men, next to the largest in the World War, was recruited by volunteer enlistment of technical and specially trained men and is believed to have included a larger number of trained engineers than any other unit.

A 35-YEAR FRANCHISE has been granted to Ulen & Co., New York, by the commissioners of King County, Wash., for a water system from the northern limits of Seattle to the Snohomish County line. It is stated that the company contemplates installing a system capable ultimately of supplying water for domestic and commercial use for a population of 1,000,000 persons.

CONSTRUCTION of 400 km. of new line by the São Paulo-Parana Railway Co. for the development of the northern territory of the State of Parana, from the agricultural point of view one of the richest parts of South America, is rapidly progressing. By the end of the year it is expected that 95 km. will be completed. Macdonald, Gibbs & Co., Ltd., of London, is the engineer and contractor.

Personal Notes

EDOUARD DE MEY has been elected vice-president of Edward Crump, Jr., Inc., of Pittsburgh, Pa.

JOSEPH DOYLE, city engineer of New Boston, Ohio, has been appointed county engineer for Scioto County, succeeding Eric Duduit, who has held the position for the past two years.

JACOB L. CRANE, JR., city planning engineer, Chicago, has gone to China as consultant on the city planning of Canton and the planning of a new port and townsite. He will proceed to Russia to advise with the Soviet authorities as to city and rural planning and will return by way of Germany to attend the International City Planning Congress at Berlin in June.

J. W. REPPEL, of Chillicothe, Ohio, formerly in the engineering department of the Pennsylvania Railroad, has been named county engineer for Ross County, Ohio.

T. P. PENDLETON, for many years associated with the U. S. Geological Survey in charge of its aerial photographic section and more recently with Brock & Weymouth, Inc., of Philadelphia, as chief engineer, has become chief engineer of the Aerotopographic Company of America.

EDMUND BRITTAN, after an association of more than nine years with Charles M. Mapes as principal engineer, announces the opening of an office in New York City for the general practice of civil engineering and land surveying.

HARRY D. CHAPMAN, formerly city engineer of Richmond, Calif., has been elected to the same position by the city council of El Cerrito, Calif., to succeed Ross Calfee.

CHARLES S. BILYEU, for the last eight years with Sanderson & Porter, engineers, of New York City, has been appointed manager of the structural steel inspection department of the Robert W. Hunt Co., with headquarters in Chicago. He will have jurisdiction over the testing and inspection of steel for buildings and bridges in all districts of the organization, succeeding W. T. REEVES, who has been appointed consulting engineer of the structural department and will continue and extend his activities in this field.

Obituary

SAMUEL HILL, railroad builder and good roads promoter, who had made Washington, D. C., his home since 1905, died on Feb. 26 in Portland, Ore., where he had stopped on his way to Salem, Ore., to address the legislature. Mr. Hill was 73 years old. While primarily a railroad man, he took great interest in the construction of roads both in his own state and throughout the country and was active in the councils of the American Road Builders' Association.

WILLIAM CROOKS, head of the William Crooks Engineering Corp., Little Rock, Ark., and former chief engineer of the Arkansas Power & Light Co., died suddenly in the lobby of a hotel in Longview, Tex., on Feb. 21. He went to Longview a few days after attending the national drainage engineers' society meeeting at Dallas, Tex., of which body he was vice-president. Mr. Crooks, who was 54 years old, was a native of Galveston, Tex., and was a graduate of Tulane University. He went with the Arkansas Power & Light Co. in 1915, and at his death was consulting engineer for that company.

SOCIETY CALENDAR

AMERICAN RAILWAY ENGINEERING ASSOCIATION, annual convention, Chicago, March 9-12.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia: regional meeting, Pittsburgh, March 18.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; spring meeting, Norfolk, Va., April 15.

AMERICAN WATER WORKS ASSOCIATION, New York; annual convention, Pittsburgh, Pa., May 25-29.

ALABAMA SECTION, American Society of Civil Engineers, on Feb. 27 held its first meeting after receiving its charter and elected the following officers: president, John A. C. Callan, professor of civil engineering, Alabama Polytechnic Institute; vice-presidents, A. Clinton Decker, Birmingham, sanitary engineer, Tennessee Coal, Iron & Railroad Co.; R. D. Jordan, Montgomery, engineer, Alabama highway department; A. R. Peyton, Birmingham, engineer, Virginia Bridge & Iron Co.; secretary-treasurer, George J. Davis, dean of engineering, University of Alabama.

AMERICAN ROAD BUILDERS' ASSOCIATION has been invited by the Cuban government to visit Cuba and make an inspection of the recently opened Central Highway. One party will leave Washington on March 13 and another will leave New York on March 11. On March 16 the president of Cuba will hold a reception to the delegates, and on the following day an automobile trip will be taken over the highway.

INDIANAPOLIS CONTRACTORS AND BUILDERS ASSOCIATION has been organized, to raise the standard of the building industry in that city in all its phases, including construction, design and financing, and to maintain the industry in the community on a high professional plane. Officers are: president, Carl W. Lindemann; vice-president, G. G. Bertels; secretary, Charles M. Snyder; treasurer, Nicholas F. Kirch.

LITTLE ROCK (ARK.) ENGINEERS CLUB elected officers on Feb. 28 as follows: president, R. A. Kern; vice-president, Leonard White; secretary-treasurer, F. L. Harget.

MARYLAND-DELAWARE WATER AND SEWERAGE ASSOCIATION will hold its fifth annual conference in Wilmington, Del., on May 5-6.

NEW ENGLAND WATER WORKS ASSOCIATION will hold its March meeting in Boston on March 11. Papers will be presented on "Practical Points on Operation of Pumping Stations for Town Water Works," by Charles E. Greene, electrical-mechanical engineer with Metcalf & Eddy, Boston, and on "Rebuilding No-Town Dam of Leominster Water Works," by W. Guy Classon, superintendent, water-works, Leominster, Mass.

SYRACUSE (N. Y.) SECTION, American Society of Civil Engineers, listened to an illustrated talk on Feb. 25 by Marshall B. Palmer, consulting engineer of the water division of the city engineer's office, on the construction of the Knapp Hill reservoir.

TACOMA SECTION, American Society of Civil Engineers, at its regular February meeting had as speaker T. G. McCrory, state highway engineer of Washington, who gave a history of the state highway system from its modest beginning to the present biennial budget submitted to the present legislature calling for $18,000,000 expenditure on state highways in the next two years.

TENNESSEE ROAD BUILDERS' ASSOCIATION at its meeting in Nashville Feb. 19 elected officers as follows: president, W. A. Patton, South Pittsburgh; vice-presidents, H. S. Walters, Morristown, and S. B. Ziegler, Nashville; secretary-treasurer, Walter E. Richardson, Nashville.

WESTERN SOCIETY OF ENGINEERS—Officers nominated for 1931-32 include: president, Frank D. Chase, president of Frank D. Chase, Inc., Chicago; vice-presidents, D. J. Brumley, Illinois Central R.R.; Harry B. Gear, Commonwealth Edison Co., and Charles C. Whittier, Robert W. Hunt Co., all of Chicago.

Construction Equipment and Materials

Spiral-Welded Product Enters Pipe-Line Field

The most recently announced process of pipe manufacture, which produces a spiral-welded product, is a development of the American Rolling Mill Co., at Middletown, Ohio, and is a direct result of this company's method of continuous rolling of steel sheets. Spiral-welded pipe is available in sizes from 6 to 24 in., and experiments are under way that indicate a 30-in. size will soon be added to the list. Any wall thickness from 12 gage to $\frac{3}{8}$ in. can be furnished with any type of coating desired—mill coat, asphalt inside and out, or galvanized.

A feature of the product is that it is made in 40-ft. lengths, which should assist materially in the reduction of field work in pipe laying as well as of shipping and handling costs. Thirty-foot lengths also are available. All pipe has a smooth inside wall which reduces friction and pumping costs. Pipe 20 in. in outside diameter of $\frac{1}{4}$-in. plate weighs 53 lb. per linear foot; similar 30-in. pipe weighs 78 lb. per linear foot. On the basis of a steel fiber stress of 10,000 lb. per sq.in., 20-in. pipe of either $\frac{1}{4}$-in. Armco ingot iron or mild steel provides a factor of safety of four with a working pressure of 250 lb. per sq.in. Similarly, 10-in. pipe is listed for a working pressure of 500 lb. per sq.in.

In developing the pipe much time has been spent not only in experimentation but in the experimental production, for the manufacture of spiral-welded pipe ties in logically with the continuous sheet-rolling process. At one stage of this process strips of metal as long as 200 ft. and of 16 gage or heavier come from the strip mill and while hot are wound into coils, as shown in one of the accompanying illustrations. It is at this point that the steel is detoured into the machinery that produces the spiral-welded pipe. Like the sheet process, the manufacture of spiral-welded pipe is continuous. Coils of iron or steel strips are placed in a decoiling device on one end of the pipe machine. After the coil is unwound and flattened it is passed to the forming rolls and welded. The spiral seam is produced by feeding the strip into the machine at an angle of approximately 45 deg. To insure joints that are as strong as or stronger than the parent metal, the weld is made somewhat oversize. The great length of the coils of metal eliminates the necessity for frequently stopping the machine to add new stock. A cut-off mechanism synchronized with the speed of the welded pipe assures accurately gaged lengths. From the welding machine the pipe goes to the testing table, where it is subjected to twice the safe working pressure.

Coiled stock ready for spiral pipe machine

Spiral welded pipe along railroad

One of the claimed advantages for the pipe is that the spiral joints serve as stiffeners to the walls of the pipe. It is also claimed that the spiral weld compensates for shrinkage, one spiral turn completely balancing all shrinkage strains in that section so that a straight, true round pipe results. The pipe can be used with welded joints or with any of the standard couplings. It is being manufactured in Armco's central works at Middletown, Ohio.

Gasoline Locomotive Driven by Standard Power Unit

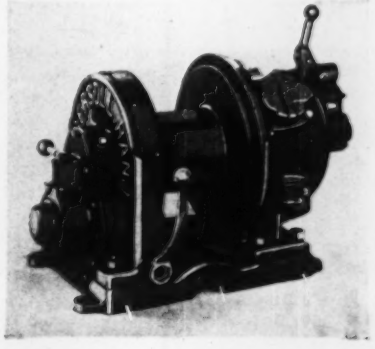
Two heavier models weighing 8 and 10 tons have been added to the BMD series of gasoline locomotives built by the Brookville Locomotive Co., Brookville, Pa. Each of these is powered by the McCormick-Deering model 300 industrial power unit, and is equipped with a five-speed transmission and clutch, also manufactured by the International Harvester Co. These standard units are installed in the chassis without alteration. By means of a Brookville inclosed gear reverse all five speeds of the transmission are available in either direction, providing an unusual number of speeds for an industrial locomotive. Gears can be shifted while in motion, giving track speeds varying from 2 to 16 m.p.h. In accordance with usual

8-ton locomotive, mine type, without cab

Brookville practice, the new models are equipped with dual spring journals and wide wheel faces in order to facilitate use upon rough and crooked tracks. They are available in any gage from 22 to 56½ in. or wider, and can be equipped with either pocket link or MCB couplers. Wheelbase, over-all height and other dimensions are variable, within limits, to suit requirements.

Air Hoist Made in Larger Size

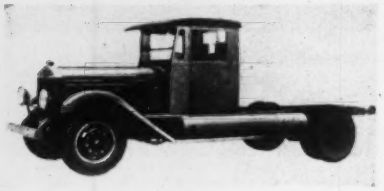
A larger and more powerful air-hoist known as the model HU has been added to the line manufactured by the Ingersoll-Rand Co., 11 Broadway, New York. This new unit has a rated capacity of 2,000 lb. at a rope speed of 120 ft. per minute, but it will handle loads greater than this. Cable capacity is 550 ft. of $\frac{5}{8}$-in. size. The base is a heavy cast-steel plate provided with holes for bolting to any flat surface, and also grooved to fit columns to which it may be clamped. A reversible four-cylinder radial piston-type air motor, accurately counterbalanced, is used. Ample lubrication is provided for all working parts. Ball or roller bearings are used throughout. Drum and motor are connected by a clutch of the jaw type, while the brake is of the external contracting type. Without cable, the hoist weighs 490 lb.; it has a length of 32 in., width of 22 in., and height of 23 in.



Air-operated hoist

Single Motor Drives Truck or Built-In Air Compressor

Cooperation between the Independent Pneumatic Tool Co., Chicago, Ill., and the Sterling Motor Truck Co., Milwaukee, Wis., has produced a dual-purpose compressor truck which is a distinct innovation in portable compressor equipment. By placing a 120-cu.ft. compressor unit under the hood of the truck and by using the truck engine as a power source, the 10-ft. space at the rear of the cab is left free for any type of body, facilitating the transportation of men, tools and materials to jobs where the compressor will be used. The truck used has a capacity of 2½



Chassis of truck-compressor unit

to 3 tons and is equipped with a standard clutch and five-speed transmission, four-wheel hydraulic brakes, electric starting and lighting equipment and pneumatic tires. Compressor controls are located inside the cab, and the air receiver is mounted on the running board. An ingenious control arrangement for the governor has been worked out so that truck and compressor operation are independent, and maximum truck speed can be controlled without affecting the standard 800-r.p.m. maximum used with compressor operation.

Semi-Trailer Collector Body for Light Trucks

Municipal demand for a semi-trailer equipped with a gravity two-way side-dump body for use in garbage, rubbish and ash collection work in connection with light trucks has led the Highway Trailer Co., Edgerton, Wis., to develop a 4½-cu.yd. body of this type which will carry from 2½ to 4 tons, depending on the class of material handled. The body is mounted on a semi-automatic drop frame steel chassis. A hand crank located on the side of the trailer is used to operate the landing gear when disconnecting the truck from the trailer. The body itself dumps by gravity, and can easily be returned to position by one man. Trailers can be equipped with a sanitary canvas cover to prevent scattering of the load by the wind. Optional equipment includes a steering gear for the rear wheels to facilitate making short turns.

Dumping semi-trailer rubbish collection body

New Publications

Excavating Machinery—Illustrated catalogs have been issued by the BUCYRUS-ERIE Co., South Milwaukee, Wis., on the model 43-B 1½-1¾ cu.yd. shovel-dragline-clamshell-lifting crane and the model 75-B 2½-cu.yd. quarry, mining and general purpose shovel-dragline.

Fluid Level Indicator—The MacCreedy fluid level indicator, an electrical system which indicates the level of reservoirs or storage tanks at a remote point, is fully described in a 12-p. illustrated bulletin issued by J. H. BUNNELL & Co., INC., 215 Fulton St., New York City.

Highway Culverts—Crushing strengths, sizes and weights of cast-iron culvert pipe and instructions for designing installations are given in a 28-p. illustrated booklet, "Highway Culverts," issued by the UNITED STATES PIPE & FOUNDRY Co., Burlington, N. J.

Pneumatic Tools—For the convenience of contractors the CHICAGO PNEUMATIC TOOL Co., 6 East 44th St., New York City, has prepared a special 12-p. bulletin describing air compressors and pneumatic tools commonly used by contractors.

Asphalt Emulsion—Methods of using Flintkote asphalt emulsion in the construction of floors and roofs are discussed in considerable detail in recent publications issued by the FLINTKOTE Co., Boston, Mass.

Grading Machinery—Bulletins covering Western rotary fresnos, snow plows for Ford and Chevrolet trucks, and the new Western No. 6 elevating grader have been issued by the AUSTIN-WESTERN ROAD MACHINERY Co., 400 North Michigan Ave., Chicago, Ill.

Motion Pictures—ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa., has prepared a motion picture showing the blasting into place of the obelisk at the Chute-à-Caron hydro-electric project in Canada. The film is of the standard 35-mm. size and requires from twelve to fourteen minutes to show. It will be loaned upon request.

Asphalt Emulsion—AMERICAN BITUMULS Co., 200 Bush St., San Francisco, Calif., has issued the third of a series of bulletins on the use of its products in highway construction and reconstruction, entitled "Retread and Road-Mix with Bitumuls HRM." Titles of the two bulletins previously issued are "Pavement Construction with Bitumuls H" and "Maintenance with Bitumuls H."

Motor Trucks—AUTOCAR Co., Ardmore, Pa., has published a 40-p. bulletin dealing with the use of motor trucks for hauling building supplies. Special emphasis is placed on the development of ready-mixed and truck-mixed concrete. This company is also distributing a special booklet on "Concrete Mixers Mounted on Autocar Chassis," which assembles in convenient form engineering drawings and essential information necessary for the mounting of specific types of mixer bodies on Autocar chassis.

Welded Pipe—A detailed discussion of the methods used in designing and constructing gas pipe lines, including a number of pages of engineering data, are given in a 52-p. illustrated bulletin 510 published by the A. O. SMITH CORP., Milwaukee, Wis.

Business Notes

JONES & LAUGHLIN STEEL CORP., Pittsburgh, Pa., announces the appointment of William B. Todd as general manager of sales.

INGALLS IRON WORKS Co., Birmingham, Ala., has opened a new branch sales office at Charlotte, N. C., in charge of I. V. Henderer, sales engineer.

MUREX WELDING PROCESSES, LTD., London, England, has been formed by the merger of Alloy Welding Processes, Ltd., and the Premier Electric Welding Co., Ltd.

GIFFORD-WOOD Co., Hudson, N. Y., has absorbed the C. W. Hunt Company, Inc., West New Brighton, Staten Island, N. Y.

NORTHWEST ENGINEERING Co., Chicago, Ill., announces the appointment of V. L. Wheeler as Chicago district manager. Mr. Wheeler has had several years of experience with the Thew Shovel Co.

SULLIVAN MACHINERY Co., Chicago, Ill., announces the following appointments: Chester G. Cummings as manager of the branch office at Cleveland, Ohio; Burt B. Brewster as manager of the Illinois-Indiana territory, with headquarters at Mount Vernon, Ill., and O. J. Neslage as manager of the office at Salt Lake City, Utah.

AMERICAN ROLLING MILL Co., Middletown, Ohio, has organized a pipe-manufacturing department in the Middletown division with C. C. Clarke as superintendent. The company's activities in the pipe field will be under the direction of the spiral welded pipe department (sales division). R. C. Beam, manager of this department, will be assisted by H. M. Ives.

INDUSTRIAL BROWNHOIST CORP. has decided to consolidate manufacturing activities and operations in one plant at Bay City, Mich. A period of from six to eight months will probably be required for the gradual transfer of manufacturing operations now located at Cleveland to Bay City, after which the Cleveland plant will be shut down. General offices of the corporation, including administrative, financial, sales, purchasing, accounting, and part of the engineering departments, will remain at Cleveland.

MACARTHUR CONCRETE PILE CORP., New York City, has advanced Richard E. Talmadge, formerly secretary and general manager, to the post of vice-president and general manager. Irvin G. Morris has been elected treasurer. William M. Chadbourne and Morgan W. Jopling have been reelected chairman of the board and president, respectively.

CLAUD S. GORDON Co., Chicago, Ill., has organized an industrial X-ray department for the purpose of examining steel, iron and metal up to a thickness of 4½ in. The new laboratory is located at Western Ave. and Fifteenth Place, Chicago, with general city offices at 708 West Madison St., Chicago, and a branch at 1988 East 66th St., Cleveland, Ohio.

BUCYRUS-ERIE Co., South Milwaukee, Wis., has acquired a controlling interest in the Monighan Manufacturing Corp., Chicago, Ill., builder of diesel and electric dragline excavators mounted on the patented Monighan walking device. The Monighan corporation will continue to operate as a separate company with unchanged management. Its product will be distributed through the sales organization of the Bucyrus-Erie Co. and its associate, Ruston-Bucyrus, Ltd., Lincoln, England.

ORVILLE P. BLAKE, district sales manager of the Inland Steel Co. at Kansas City, Mo., died at Denver, Colo., on Feb. 25 of pneumonia. Mr. Blake first joined the Inland sales staff in 1906 as manager of the company's St. Louis office.

CHARLES BRUNING, founder and president of the Charles Bruning Co., Inc., Chicago, manufacturer of sensitized paper, suffered a stroke while recuperating in Phoenix, Ariz., and died on Jan. 30.

Business Side of Construction

February Contracts Drop

Awards of engineering construction contracts in February were at the rate of 45 million dollars per week, compared with 47 in January and 49 millions in February, 1930. For the first two months of the year, the weekly rate has been as follows: 1931, 46 millions; 1930, 48 millions; and 1929, 85 millions.

Comparison with the January weekly rate shows a gain in buildings—24 per cent in industrial and 5 per cent in buildings other than industrial. Sectionally, there were substantial gains in the South and throughout the entire West, while New England and the Middle Atlantic states sustained decreases.

As compared with the same month last year, February showed a gain of 7 per cent in public works. Sectionally the same situation exists as in the comparison with January. In the chief classifications, advances in percentages were as follows: federal government, 82; streets and roads, 27; public buildings, 20; water-works, 10. Declines were as follows: Bridges, 73; commercial buildings, 40; sewers, 30; industrial buildings, 13; excavating, 8.

February Employment Slower in Building Trades

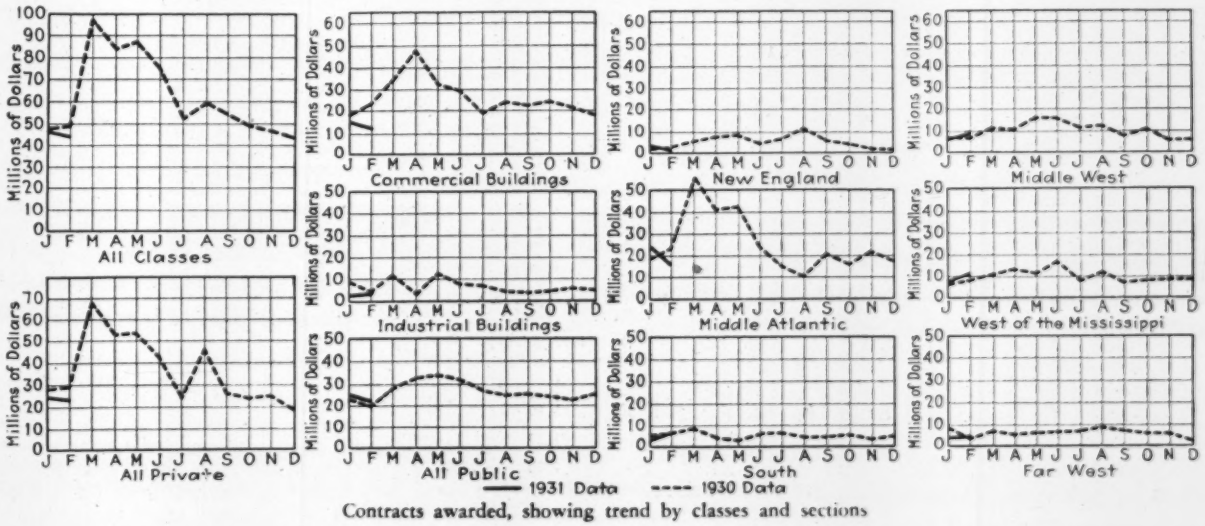
With unemployment throughout the nation at an estimated 5,700,000, more than twice the number reported in the census of April, 1930, the belief is held in some quarters that business struck the bottom in the present slump during the period embracing the last 60 days. No clearly defined trend is visible for March. The building and garment trades still appear to be the hardest hit. Manufacturing, while it held its ground during February, showed no such marked improvement as occurred in January, when 300,000 workers returned to many specific plants throughout the country. Two-thirds of the January replacements, however, were in the automotive industry. A. F. of L. figures show unemployment in the building trades to have increased from a level of 51 per cent in January to 52 in February, compared with 43 per cent in February, 1930.

Announcements from Washington state that in the month ending March 20 employment in federal construction activities would be tripled, thereby raising the total number employed in this field to 450,000 workers.

Of all the various forms of public construction proposed by the several states, roadwork is by far the most conspicuous. Total road program for the 48 states in 1931, inclusive of federal aid funds, amounts to $987,771,000, compared with $957,133,000 in 1930 and $763,058,000 in 1929, on the same basis. Examination of data from ten states gives reason to believe that to each $3,000 expended on roadwork employment is given to one man for the duration of construction. With this in view, it is foreseen that approximately 329,257 men will have work on the roads this year, an increase of 3 per

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN FEBRUARY, 1931
Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States Feb., 1931	United States Two Months 1931	United States Two Months 1930	Canada, Feb., 1931
Water-works	$215*	$1,403	$76	$443	$901	$72	$3,110	$8,541	$7,658	$626
Sewers	115	1,087	504	905	291	141	3,043	8,122	12,780	767
Bridges, public	157	221	373	524	964	238	2,477	13,905	16,603	300
Excavation		75	1,242	173	210	68	1,768	4,676	5,245	33
Streets and roads	1,181	11,176	14,617	3,282	4,703	1,723	36,682	76,302	61,087	679
Federal government	670	4,980	1,904	2,064	2,812	2,141	14,571	25,147	17,561	
Unclassified, public	72	3,507		25	1,001	1,028	5,633	21,767	24,081	5,684
Buildings, public	929	5,247	837	524	2,353	3,138	16,553	41,912	36,478	512
Total public	3,339	27,696	19,553	11,465	13,235	8,549	83,837	200,372	181,493	8,601
Buildings, industrial	535	4,965	1,630	2,080	893	4,016	14,119	28,254	54,939	315
Buildings, commercial	1,804	25,871	360	10,451	8,359	3,587	50,432	104,748	157,087	150
Bridges, private								230	1,475	
Unclassified, private	215	1,330	40	11,928	15,628	1,013	30,154	82,133	39,330	2,025
Total private	2,554	32,166	2,030	24,459	24,880	8,616	94,705	215,365	252,831	2,490
February total, 4 weeks	**5,893**	**59,862**	**21,583**	**35,924**	**38,115**	**17,165**	**178,542**			**11,091**
January, 1931, 5 weeks	13,138	118,362	18,201	33,812	32,700	20,982	237,195			12,690
February, 1930, 4 weeks	8,694	94,780	21,366	24,376	30,749	15,423	195,388			13,170
Two months, 1931	19,031	178,224	39,784	69,736	70,815	38,147		415,737		23,781
Two months, 1930	16,047	191,290	44,298	58,642	63,205	60,842			434,324	27,882



Contracts awarded, showing trend by classes and sections

cent over 1930 and 29 per cent over 1929.

The Wagner bill, providing for nationwide state-federal employment agencies, was passed Feb. 23, after a three-year battle to get it through. The measure involves $4,000,000 in federal aid annually.

Various moves are being made to retain present wage schedules and also to restrict unemployment by excluding convicts and aliens from the field of competition.

According to Arthur Woods, the report of the Association of Flat-Rolled Steel Manufacturers is one of the best examples of industrial stabilization which has so far reached the attention of the President's Emergency Committee for Employment. The members of this association have applied means to carry, in so far as possible, full working forces on a part-time basis. On continuous operation, the usual method has been to divide the day into four six-hour shifts, instead of three eight-hour turns. Where the work is on a daily or hourly basis, the hours per day or days per week have been arranged so as to spread the work among the men as evenly as possible.

In general, there has been no appreciable reduction in union wage scales in this depression, yet living costs have declined 6.2 per cent. In the depression of 1921 the drop in living cost was 13 per cent. Federal Reserve computations show that in the 1921 depression individual workers' incomes dropped 15 per cent, compared with a 6 per cent decline in the present slump.

Two important unemployment-benefit plans were evolved during February, one in Pittsburgh and the other in Rochester, details of which are given later. Local reports follow:

Boston—Massachusetts State Building Trades Council asks that preference be given citizens in employment on public construction projects. Fore River shipyards of the Bethlehem Shipbuilding Corp. will add 1,000 men to its forces this year, with further increases scheduled for the next two years.

Rochester—Fourteen industries have adopted an unemployment benefit plan whereby 2 per cent of the annual payrolls of these companies will be pooled to form a fund equal to five annual appropriations. In the event of emergency, employees will be assessed 1 per cent of their earnings until the emergency has passed. Unemployment benefits will be paid on the basis of 60 per cent of weekly earnings, with a maximum payment $22.50 per week. The Rochester plan is independent of public aid and places no burden on the worker except in case of emergency.

New York—A decline in employment in the building trades of this city is indicated in the decreasing steel tonnage, designed for shipment to New York, now on the books of fabricating shops. Inasmuch as the steel frame predominates here, the fact that employment of structural ironworkers in February (1,187 men) was 40 per cent under that of the same month last year is no augury of good for the craftsmen whose operations follow those of the steel erectors. Moreover, a record number of architects and architectural draftsmen are idle; about 3,000 of the former and 12,000 of the latter. A fund of $8,000,000, collected by the Emergency Employment Committee, will have been exhausted by April 1. It is evident now that the crisis will extend considerably beyond April 1. Repaving of city streets, most of it done at night and planked over during the day, is 35 per cent ahead of the first two months of last year. This has had its effect on the unemployment situation. A fund of $750,000 was appropriated Feb. 24 for repair of docks, bulkheads and ferry slips as an emergency measure. The work is to be done in half-time shifts, at cost.

Camden—Work resumed on two new 30,000-ton liners of the United States lines after a shut-down, Feb. 14. Payments made from construction-loan funds of the Shipping Board enabled work to proceed after adequate security had been provided.

Pittsburgh—The Pittsburgh plan for reducing unemployment divides the work into two distinct groups—complete charitable cases and those able to work, the latter to receive their accustomed wages, according to trade. The necessary funds will be contributed by 3,000 employers, who will give the equivalent of one day's payroll as of 1929, and to this will be added contributions of wealthy residents of Pittsburgh. Workers will be requested to contribute one day's wages. Churches, charitable institutions and those of a semi-public nature obtaining labor for construction purposes must supply the necessary materials at their own expense. Labor will be allocated proportionately to those contributing to the fund.

Birmingham—In the structural, slate, sheet and rail mills, shifts which were recently on two days a week have been stepped up to four and five, while those formerly on four to five days are now working full time. About 1,500 men will be granted work on park improvement projects.

New Orleans—Construction of sea walls and lined canals is absorbing some of the erstwhile idle carpenters and common laborers. Registered unemployment now up to 12,000. Loans totaling $2,000,000 have been extended to property holders throughout the city for repairs and improvements, as unemployment relief measure.

Chicago—Painters request a three-day week on the rotation plan, in order to give each man a share of the work. At the end of every third day a new crew is to report for duty, according to the plan.

Cleveland — Employment given to 1,000 men on terminal development. An immense store project soon to use 2,000 additional men.

Detroit—About 500 men were dropped from payrolls of the department of public works during the week of Feb. 3. Suspension believed to be temporary.

Kansas City—Bricklayers ask an increase of $1.33 per day, to $13.33, and a five-day week, at expiration of present contract with the Builders' Association.

Ogden—Approximately 800 men will be given work on the construction of a new gas pipe line between Ogden and Pocatello. Request of bridge and structural ironworkers in Utah for five-day week and wage increase of $1 per day, to $10, denied Feb. 12 by organized contractors.

San Francisco—As a result of the $2,500,000 bond approval, city engineer announced employment of 1,500 men Feb. 10. This number will be increased until approximately 4,000 men will be working each week or the full number of registered unemployed at work every other week.

CURRENT BUILDING AND CONSTRUCTION TRADES WAGE RATES PER HOUR

Advances since last month are indicated by **heavy type**, declines by *italics*

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor*
Atlanta	$1.25@1.40	$0.60@.70	$0.60@1.00	$0.50	.....	$0.75@1.25	$0.25@.35
Baltimore	1.75	1.00@1.10	1.00@1.37½	1.00	$0.65	1.00@1.25	.30
Birmingham	1.50	1.00	1.25	.50	.....	1.25	.20@.35
Boston	1.50	1.37½	1.37½	.85	1.27½	1.37½	.45@.80
Cincinnati	1.62½	1.40	1.40	1.00	1.40	1.40	.35@.60
Chicago	1.70	1.62½	1.62½	.97½	1.62½	1.62½	.97½
Cleveland	1.62½	1.37½	1.37½	.87½	1.10	1.50	.35@.60
Dallas	1.75	1.12½	1.25	.35@.75	1.25	1.25	.35@.50
Denver	1.50@1.62½	1.25	1.25@1.37½	.87½@1.00	.....	1.25	.20@.62½
Detroit	1.56¼	1.00@1.25	1.00@1.10	.90	1.00@1.10	1.00@1.25	.50@.60
Kansas City	1.50	1.37½	1.37½	.90	1.50	1.37½	.30@.75
Los Angeles	1.37½	1.00	1.00	.75	.87½	1.00	.50
Minneapolis	1.30	.90	.90@1.00	.80	.....	1.00@1.25	.50@.65
New Orleans	1.00	.50@.75	1.25	.75	.80@1.00	1.12½@1.25	.20@.35
New York	1.92½	1.65	1.92½	1.03½	1.78½	1.92½	1.03½
Philadelphia	1.75	1.25	1.02½@1.36	.70@1.12½	1.00	1.37½@1.62½	.40@.50
Pittsburgh	1.75	1.50	1.50@1.56¼	1.12½	.....	1.50	.40@.80
St. Louis	1.75	1.50	1.60@1.75	1.15@1.25	1.25	1.50	.30@.87½
San Francisco	1.37½	1.12½	1.12½	.87½	1.12½	1.37½	.68¾
Seattle	1.50	1.12½	1.12½@1.25	1.00	1.25	1.25	.70
Average	1.56	1.20	1.28	0.8715	1.20½	1.33	0.5571
Montreal	1.25	.80	.75	.....	.90	1.00	.30@.35

*Minimum rates are non-union and for construction other than buildings.

Seattle—Resumption of lumbering and logging predicted for next 60 days. No other visible improvement in employment.

Wage Rates—The average skilled rate in constuction is $1.36½ per hour, compared with $1.37½ for February and $1.38 in March, 1930. The average rate for common laborers is 53.71c., compared with 54.28c. in February and 56.1c. in March, 1930. Manufacturing skilled rate is 65.7c. and that of the unskilled 48.6c. per hour.

Materials Prices Lower in February

Several important declines which occurred in prices of materials during February, accentuated by the absence of compensating advances, give the market an unfavorable appearance with which to begin a spring month. Cement mills are cutting and in some cases revamping prices; reinforcing bars are lower; timbers, wood blocks and piles are down in certain instances; a small price war affects aggregates; cast-iron pipe buyers hold off for concessions. Meanwhile no definite advance has occurred in any one material or locality. Under separate paragraphs, each major material is treated as follows:

Cement—An investigation of the cement industry was ordered Feb. 16 by the Federal Trade Commission in an effort to find out whether or not the anti-trust laws are being violated. The resolution was based on alleged uniformity of prices in general bidding. Oklahoma state highway bids received Feb. 3 on 1,000,000 barrels of cement range from $2 down to $1.40 per barrel. The unexpectedly low bids may result in additional purchases of perhaps 250,000 bbl. The price war among manufacturers at f.o.b. points still rages in the Middle West and parts of the South. Actual areas affected are Iowa, Minnesota, Indiana, Wisconsin, Illinois, Ohio, Tennessee and Georgia. Dealers' delivered prices seem not to reflect the heavy cuts (in some cases 19c. per barrel) sustained in f.o.b. carlot transactions in the last month. The Boston price is down 5c. per barrel, to $2.30, delivered. Retailers are at present concerned chiefly with sales in carload quantities as opposed to the conception that the dealer serves as an outlet for small-lot trading. The furore among the dealers caused by the reduction in the 10c. discount has congealed in the form of a three-way market, so far as manufacturers' selling plans are concerned. Certain of the manufacturers still grant the dealer a discount of 10c. per barrel, with mill prices unchanged. Others, having reduced the mill price 5c., grant a discount of 5c. per barrel, payable at the end of twelve months. A third group, having reduced the mill price 10c., grant no discount whatever, except, of course, for cash, as in any other business transaction.

Concrete Aggregates—Producers and dealers in the St. Louis district are waging a lively price war locally. There is even rivalry between the crushed-stone quarrymen and the gravel-pit owners, with Illinois producers coming over into the St. Louis market to compete.

Brick—Prices have not moved much in the last month. Common building grade rose $1 per thousand, to $13, at New Orleans, and dropped 50c., to $14.50, delivered, in Boston. There were no major instances of plant shutdowns as in January. For a market which in the past has depended so largely upon water shipments of construction materials, Manhattan appears definitely to have turned toward container-car methods of furnishing its brick requirements. To cite an instance, during the first two weeks of February not a single bargeload of brick was sold at wholesale in this market. In the same period, however, 230 container-carloads (9,000,000 bricks) were delivered to consumers at New York.

Lumber—The market has been stagnant during February, and lumbermen attribute it largely to the 45 per cent decline in residential building which has marked the last twenty months. Retail dealers' stocks are low—the buyers should keep that in mind. Mill stocks are 4,530,000,000 ft., or 5.8 per cent, above those of a year ago. The retail-stock situation is such that a barely perceptible increase in general demand would start dealers buying. Water freight rates are up 50c., despite low prices of West Coast fir due to speculation in Eastern ports. New York subway contractors, in preparing their estimates, are feeling out the market with inquiries involving large quantities of structural timbers. Timbers have been moving of late nearly as slowly as have small sizes for dwelling house construction. The worst news, from the lumbermen's viewpoint, is that a proposed embargo on cheap Russian lumber (mostly spruce) has been halted. Both pine and fir prices are weak at present. At Chicago 3x12 pine is off $3 per 1,000 ft., to $58, and $1 in Boston, to $57, while at Seattle the base for 3x12 fir is down $1@$3 to $18@$20, compared with prices as of Feb. 1. A year ago the prices were $62.50, $60 and $21, respectively.

Wood Blocks—A decline of 25c. per square yard, to $2.50 f.o.b. Minneapolis, during February was due to lower cost of both lumber and oil. At Cincinnati wood blocks are practically out of the market.

Piles—Pine, all sizes, dropped 1½c. per linear foot f.o.b. New York during the latter part of February.

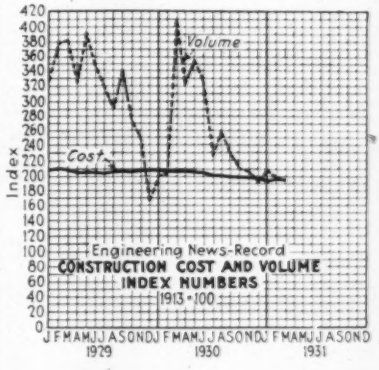
Hollow Tile—Competition for orders waxes keen in the Western markets, particularly those of Chicago and Cleveland. In the East this condition is less noticeable. Chicago prices held, while those in Cleveland dropped fractionally during February. Boston prices are higher this month on sizes above 6 in. Stocks of this material are said to have increased appreciably in the last month.

Steel—Structural shapes hold at the February level of $1.65 per 100 lb., Pittsburgh; the price a year ago was $1.80. In the Youngstown district producers talk of advancing prices, more in order to report better earnings than because actual sales warrant an increase. A rise of 188,755 tons in the unfilled-orders report issued Feb. 10 might suggest optimism were it not recalled that both shipments and mill operations have lagged considerably of late. Reinforcing bars are off 10c. per 100 lb., to $1.65, Pittsburgh, in mill lengths. Buying is mostly for public works, private construction taking small lots of less than 100 tons.

Cast-Iron Pipe—Price is down $1 per ton, to $36@$37, on 6-in., f.o.b. Birmingham, for regular lots. The market is weak and yet there is in the offing a considerable volume of municipal lettings.

Construction Cost and Volume Index Numbers

Costs declined 1 per cent during February and are 5 per cent under those of a year ago. The volume index is 4.8 per cent under that of January and 2.9 per cent under that of February, 1930.


Volume
Cost
Index
Engineering News-Record
CONSTRUCTION COST AND VOLUME INDEX NUMBERS
1913 = 100
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931

E. N.-R. Cost		E. N.-R. Volume*	
March, 1931	**194.51**	**Feb., 1931**	**198**
Feb., 1931	195.61	Jan., 1931	208
March, 1930	206.80	Feb., 1930	204
1930 (average)	202.85	1930 (average)	260
1929 (average)	207.02	1929 (average)	317
		1913 (average)	100.00

1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95	August	259
September	199.58	September	232
October	198.72	October	211
November	198.54	November	207
December	196.86	December	192
1931		1931	
January	194.48	January	208
February	196.61	February	198
March	194.51		

*Corrected for price change since 1913

Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type**; declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, for cement in cloth, *without including charge for four bags at 10c. each*. Cash discount not deducted. Prices are delivered by truck to contractors at site of job:

	March 5, 1931	One Mo. Ago	One Yr. Ago
Atlanta	$2.60	$2.38	$2.35
Baltimore	2.60	2.60	2.40
Birmingham	2.60	2.60	2.40
Boston	*2.30*	2.35	2.65
Chicago	2.10	.....	.....
Cincinnati	2.26	2.26	.....
Cleveland	2.00	.....	.....
Dallas	2.15	2.15	2.15
Denver	2.20	2.20	2.61
Detroit	2.05	.....	.....
Jersey City	2.33	2.33	2.60
Kansas City	2.50	2.15	2.65
Los Angeles	1.92	1.92	1.92
Minneapolis	2.50	.....	.....
Montreal	2.20	2.20	.....
New Orleans	2.35	2.35	2.65
New York	2.10	2.20	2.30
Philadelphia	2.15	2.15	2.10
Pittsburgh	2.15	2.15	.....
St. Louis	2.15	2.15	2.10
San Francisco	2.64	2.64	2.54
Seattle	2.25	2.25	2.70

Current mill-prices per barrel, in carloads, without bags, f.o.b.:

Alpena, Mich.	$1.55	Limedale, Ind.	*$1.50*
Buffington, Ind.	*1.44*	Mason City, Ia.	*1.66*
Hannibal, Mo.	*1.66*	Norfolk, Va.	*1.76*
Houston, Tex.	1.94	Northampton, Pa.	*1.51*
Hudson, N. Y.	*1.61*	North Birmingham, Ala.	*1.56*
Ironton, Ohio	*1.56*	Steelton, Minn.	*1.61*
Iola, Kan.	*1.56*	Universal, Pa.	*1.46*
La Salle, Ill.	*1.49*	Wyandotte, Mich.	1.50

SAND AND GRAVEL—Per ton, delivered by dealers. Weight of sand per cu.yd., 1½ tons; gravel, 1½ tons, unless otherwise specified in pounds:

	Gravel		Sand
	1½ In.	¾ In.	
Atlanta	$3.25	$3.25	$2.50
Baltmore	2.35	2.55	2.08
Birmingham, per cu.yd., 2,600 lb.	3.50	3.50	3.00
Boston	1.75	1.75	1.15
Chicago, per cu.yd.	2.00	2.00	2.00
Cincinnati	1.75	1.75	1.50
Cleveland, per cu.yd., 3,000 lb.	2.60	2.60	2.50
Dallas, per cu.yd., 2,750 lb.	3.00	3.00	2.50
Denver, per cu.yd., 2,700 lb.	1.95	1.95	1.35
Detroit	2.50	1.85	1.65
Kansas City	1.75	1.75	1.75
Los Angeles	1.50	1.50	1.50
Minneapolis, per cu.yd., 2,800 lb.	2.40	2.40	1.10
Montreal	1.25	1.25	1.25
New Orleans, per cu.yd., 2,700 lb.	2.95	2.95	1.80
New York, per cu.yd.	3.40	3.40	2.15
Philadelphia	2.30@3.15	2.30@3.15	1.50@2.31
Pittsburgh	1.55	1.55	1.75
St. Louis	1.40	1.40	1.00@1.20
San Francisco	1.75	1.75	1.75
Seattle, per cu.yd., 3,200 lb.	1.75	1.75	*1.65*

Note: New York gravel weighs 2,800@3,000 lb. and sand, 2,700 lb. per cu.yd.

CRUSHED STONE—Per ton, delivered by dealers. Weight per cu.yd., 1½ tons, unless otherwise specified in pounds:

	1½ In.	¾ In.
Atlanta	$3.25	$3.25
Baltimore	2.60	2.80
Birmingham, limestone, per cu.yd.	3.00	3.25
Boston	2.00	2.00
Chicago, limestone, per cu.yd., 2,500 lb.	2.00	2.00
Cincinnati	2.25	2.25
Cleveland	2.60	2.60
Dallas, per cu.yd., 2,500 lb.	3.25	3.25
Denver, granite, per cu.yd., 2,700 lb.	2.50	2.50
Detroit, limestone	2.25	2.25
Kansas City	1.90	1.90
Los Angeles	1.40	1.40
Minneapolis, limestone, per cu.yd., 2,600 lb.	2.40	2.40
Montreal	1.90	2.10
New York, limestone, per cu.yd.	3.40	3.40
Philadelphia, limestone	2.30@3.15	2.30@3.15
Pittsburgh	2.75	2.75
St. Louis	1.40	1.40
San Francisco, trap rock	1.65	1.65
Seattle, per cu.yd., 2,700 lb.	3.00	3.00

CRUSHED SLAG—Prices for carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala.	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	1.10	1.10	.....	1.30
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.10	1.10	1.10	1.00
Youngstown District	1.25	1.35	2.00	1.25

CONCRETE BLOCKS—Manufacturers' quotations on standard, 8x8x16-in., hollow, delivered to job, each:

Boston	$0.18@$0.20	Minneapolis	$0.11
Brooklyn and Queens	.12@ .14	New Orleans	.20
Cleveland	.16@ .17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	.20
Detroit	.15	St. Louis	.17
Kansas City	.18		

HOLLOW TILE—Building tile per block, delivered by dealers to contractors in lots of 2,000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x12
Atlanta	$0.14	$0.18	$0.24	$0.30	$0.36
Baltimore	.105	.....	.20	.....	.26
Birmingham	.09	.127	.174	.218	.261
Boston	.08	**.117**	**.152**	.21	**.35**
Chicago	.068	.0935	.1275	.1647	.183
Cincinnati	.06815	.09485	.129	.165	.184
Cleveland	*.048*	*.066*	*.09*	*.117*	*.13*
Dallas	.103	.136	.194	.251	.306
Denver	.0975	.135	.175	.2125	.25
Detroit	.098	.135	.184	.24	.265
Kansas City	**.088**	**.11**	.158	.24	.265
Los Angeles	.085	.122	.175	.232	.285
Minneapolis	.0611	.081	.10605	.1302	.1737
New Orleans	.068	.093	.13	.176	.212
New York	.0864	.1296	.162	.....	.....
Perth Amboy, N. J. (f.o.b.)	.....	.....	.....	.2388	.2956
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	.056	.078	.1175	.14	.1726
St. Louis	.075	.10	.14	.175	.21
San Francisco	.108	.156	.255	.....	.....
Seattle	.085	.115	.18	.....	.....

BRICK—Prices delivered by dealers per thousand, are as follows:

	Common	Paving F.O.B. 3x8½x4-In.	Paving F.O.B. 3½x8½x4-In.
Atlanta	$17.00	$42.00	.....
Baltimore	13.00	40.00	$46.00
Birmingham	15.50	31.00	.....
Boston	*14.50*	43.00	47.00
Chicago	12.00	42.00	45.00
Cincinnati	16.00	35.00	37.00
Cleveland	12.00@14.00	33.00	36.00
Dallas	14.50	.....	.....
Denver	9.00@10.00	.....	.....
Detroit	*14.50*@15.50	**35.50**	**37.50**
Kansas City	15.00	.....	.....
Los Angeles	10.00	.....	.....
Minneapolis	10.00	.....	.....
Montreal	20.00	.....	.....
New Orleans	**13.00**	38.00	45.00
New York	13.00	45.00	50.00
Philadelphia	15.50	40.00	45.00
Pittsburgh	16.00	40.50	45.00
St. Louis	12.00	36.00	38.00
San Francisco	12.00	45.00*	.....
Seattle	14.00	48.50†	61.00‡

*2½x8½x4 in. †2½x8½x4. ‡3½x8½x4.

FACE BRICK—Price delivered to job, New York, average grade, rough, red, per thousand *$28.00*

LIME—Prices delivered by dealers to job:

	Hydrated, per Ton		Lump, per Barrel	
	Finishing	Common	Finishing	Common
Atlanta	$23.00	$15.50	.....	.....
Baltimore	22.00	14.00	.....	.....
Birmingham	22.00	16.00	$3.00†	$2.00†
Boston	22.00	**14.50**	4.00*	3.10*
Chicago	17.00	14.50	15.00‡	15.00‡
Cincinnati	13.05	10.70	.....	.....
Cleveland	14.00	12.00	2.50†	2.50†
Dallas	20.00	.....	2.35†	.....
Denver	32.00	23.75	3.80*	3.00*
Detroit	18.00	14.80	2.20†	2.00†
Kansas City	*19.50*	.....	2.20†	.....
Los Angeles	18.90	16.00	2.85†	14.00‡
Minneapolis	25.50	21.00	.....	1.70†
Montreal	19.75	.....	.....	15.00‡
New Orleans	25.00	15.50	2.65†	1.95†
New York	21.00	15.50	4.10*	3.15*
Philadelphia	22.00	15.00	.....	.....
Pittsburgh	20.00	15.00	4.25*	.....
St. Louis	24.00	18.00	15.00‡	2.75†
San Francisco	20.00	20.00	.....	1.85†
Seattle, paper sacks	35.00	24.00	.....	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

LIMESTONE—Blocks, f.o.b. siding, New York, per cu.ft.:

Run of quarry	$1.27	Standard	$1.57
Rustic buff	1.42	Selected gray	1.57
Standard gray	1.47	Selected buff	1.67

SLATE—Roofing, f.o.b., quarry, Bangor, Pa., net, per square:

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	7.50@ 10.25
Medium Clear	8.00@ 10.50

Road and Paving Materials

PAVING STONE—Carload lots of granite blocks, 4x8x4-in., dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	135.00 per M.
Chicago, 5 in.	3.25@3.90 per sq.yd.
Cincinnati	110.00 per M.
Cleveland	115@120 per M.
Detroit, 5 in.	3.00 per sq.yd.
Kansas City	**3.85** per sq.yd.
Minneapolis, 4½x8x5 in.	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in., Grade 1, 30 blocks per sq.yd.	150.00 per M.
Philadelphia	125.00 per M.
St. Louis, 4x5x8 to 12 in.	3.50 per sq.yd.

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	2.00
Kansas City	3½	16	2.75
Minneapolis	3½	16	*2.50*
Montreal	4	16	4.50
New Orleans	3½	16	2.40
New York	3½	16	2.50
St. Louis	3½	16	2.10

FLAGGING—Alongside dock, New York: Manhattan and Bronx, 4 ft. wide, 24c. per sq.ft.; Queens, 5 ft. wide, 26c. per sq.ft.

CURBING—*New York*: Bluestone, f.o.b. barge, 5x16 in., rough, 90c. per lin.ft., cutting charges extra. *Birmingham*: Limestone, 5x18-in., f.o.b., $1.05 per lin.ft. *St. Louis*: Class "B" straight, 5x16-in., f.o.b., $1.00 per lin.ft.; roundings, $1.35 per lin.ft.

ASPHALT—Manufacturers' quotations per ton in packages (350-lb. bbls or 425-lb. drums), also in tank-car lots, f.o.b. points listed:

	Package	Tank-car or Bulk
Atlanta	$20.40	$17.40
Baltimore	21.75	17.75
Birmingham	27.00	23.00
Boston	23.00	18.00
Chicago	23.50	19.30
Cincinnati	.....	12.30
Cleveland	24.00	20.00
Dallas	*20.00*	.....
Denver	35.00	.....
Detroit	19.72	14.87
Kansas City	28.00	*22.00*
Los Angeles (f.o.b. refinery)	18.00	12.00
Maurer, N. J. (Bermudez)	30.00	.....
Maurer, N. J. (Trinidad)	25.00	.....
Minneapolis (f.o.b. Twin Cities)	23.10	18.10
Montreal	28.00	21.50
New Orleans	24.00	21.00
New York (f.o.b. refinery)	16.00	12.00
Philadelphia	17.00	13.00
Pittsburgh	24@26	14@18
St. Louis	22.50	18.50
San Francisco (f.o.b. refinery)	18.00	12.00
Seattle	21.40	18.00

ROAD OILS—Manufacturers' quotations, f.o.b., in tank cars, 8,000 gal. minimum, per gal.:

Birmingham, 40@50% asphalt	$0.0525
Birmingham, 50@60% asphalt	.0525
Dallas, 40@50% asphalt	.06
Dallas, 50@60% asphalt	.06
New York, 40@50% asphalt	.05
New York, 50@60% asphalt	.05
St. Louis, 40@50% asphalt	.04
St. Louis, 50@60% asphalt	.04

Iron and Steel

PIG IRON—Producers' quotations, per gross ton, f.o.b.:

Birmingham, No. 2 fdry., silicon, 1.75@2.25	$14.00
Pittsburgh, basic, incl. freight ($1.76) from Valley	*18.13*

STRUCTURAL STEEL—Manufacturers' and dealers' quotations per 100 lb.

	Shapes, 3 to 15-In.	Plates, ¼-In.
Birmingham, large mill lots, f.o.b.	*$1.75*	*$1.75*
Chicago, warehouse, delivered, 400 to 3,999 lb.	3.00	3.00
Cleveland, warehouse, delivered	2.95	3.00
Dallas, warehouse, delivered	3.90	4.00
New York, warehouse, delivered, 400 to 3,999 lb.	3.10	3.10
Pittsburgh, large mill lots, f.o.b.	1.65	1.65
St. Louis, warehouse, delivered	3.25	3.25
San Francisco, warehouse, delivered	3.40	3.40

BARS, CONCRETE REINFORCING—Manufacturers' and dealers' quotations on bars rolled from billets, per 100 lb. for ½-in.:

Birmingham, large mill lots, f.o.b.	*$1.80*
Chicago warehouse, delivered	2.15@3.00
Cleveland, warehouse, delivered	2.25@2.44
Dallas, warehouse, delivered	2.50
New York, warehouse, delivered, 5-ton lots	2.45
Pittsburgh, large mill lots, stock lengths, f.o.b.	*1.65*
St. Louis, warehouse, delivered	3.15
San Francisco, warehouse, delivered	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job, in lots under 200 sq.yds:

Lb. per Sq.Yd.	New York	Birmingham	Chicago	St. Louis	Dallas	San Francisco
2.2	$15.50	*$19.50*	$10.10*	$18.00@19.00	$18.00	$21.50
2.5	16.50	*20.50*	10.90*	19.00@20.00	19.50	22.50
3.0	18.00	*22.50*	12.25*	20.50@21.50	.....	25.00
3.4	19.00	*24.00*	13.10*	21.50@22.50	24.00	27.00

*More than 200 sq.yds.

WIRE REINFORCEMENT FOR CONCRETE—Plain, per 100 sq.ft., 4 in. x 4 in. mesh; manufacturers' quotations are in carloads at mills; dealers' are delivered in lots of 10,000 sq.ft. or over:

Style Number	Weight in Pounds per 100 sq.ft.	Pittsburgh Mill	Chicago District Mill	Del. From Warehouse: New York	St. Louis	Dallas	San Francisco
032	22	$0.94	$0.96	$1.32	$1.30	$1.63	$1.22*
049	28	1.20	1.23	1.67	1.70	2.00	1.55*
068	35	**1.47**	1.50	2.07	2.10	2.25	1.91*
093	45	1.88	1.93	2.65	2.65	2.86	2.46*
126	57	2.33	2.38	3.28	3.30	3.52	3.03*
153	68	**2.78**	2.84	3.92	4.00	4.20	.....
180	78	**3.19**	**3.27**	4.49	4.60	4.80	.....

* F.o.b.

STEEL SHEETS—Manufacturers' and dealers' quotations per 100 lb. base:

	Blue Annealed No. 10*	Black No. 24	Galvanized No. 24
Chicago, warehouse, delivered	$3.35†	$3.80†	$4.35†
Cleveland, warehouse, delivered	3.00	3.60	4.20
New York, warehouse, delivered	3.00	3.50	4.00
Pittsburgh, large mill lots, f.o.b.	1.90	2.35@2.45	2.90@3.00
St. Louis, warehouse, delivered	3.45	4.05	4.60
San Francisco, warehouse, delivered	3.80	4.35	4.85

*Light plates. †400 lb. to 3,999 lb.

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River.

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	50%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas. Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Manufacturers' and dealers' quotations on structural rivets, round head, ½-in., full kegs, per 100 lb.:

Chicago, warehouse, delivered	$4.00
Dallas, warehouse, delivered	5.00
Denver	4.65
New York, warehouse, delivered	4.25
Pittsburgh, large mill lots, f.o.b.	2.75
St. Louis, warehouse, delivered	4.15
San Francisco, warehouse, delivered	5.00
Seattle, warehouse, delivered	5.00

STEEL SHEETPILING—Manufacturers' base price, f.o.b. Pittsburgh, for large mill lots, per 100 lb. $1.90

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b. Pittsburgh mill:
Per package $10.30

SHIP SPIKES—Per 100 lb., black, from dealers' warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	½-In.	⅝-In.	¾-In.
San Francisco	$5.50	$5.05	$4.90
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, $3.00 per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh Mill	Birmingham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$1.95@$2.00	$3.30	$3.10	$2.50	$3.50	$3.25	$4.95

SCRAP—The prices following are, f.o.b., per ton, paid by dealers:

	New York Per Gross Ton	Chicago Per Gross Ton	Detroit Per Gross Ton
No. 1 railroad wrought	$8.75	*$9.25@$9.75*	.....
Stove plate	4.75@5.50	*8.00@8.50*	$6.00
No. 1 machinery cast	8.00	*11.00@11.50*	**9.00***
Machine shop turnings	**3.50**	*4.50@5.00*	**4.75**
Cast borings	3.50	*4.50@5.00*	*5.25*
Railroad malleable	9.50	*12.00@12.50*	11.00
Re-rolling rails	9.25	*11.25@12.25*	10.00
Misc. steel rails	.....	10.50@11.00	12.50
Heavy melting steel, No. 1	*6.25*	10.00@10.25	10.00
Iron and steel pipe	7.25	6.00@6.50	.....

*Net ton.

FREIGHT RATES—The following freight rates per 100 lb., effective May 20, 1930, apply on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc.:

Atlanta	$0.58*	Detroit	$0.265†
Baltimore	.27†	Kansas City	.695†
Birmingham	.58*	New Orleans	.67*
Boston	.40†	New York	.33†
Buffalo	.235†	Pacific Coast (all rail)	1.15‡
Chicago	.34†	Philadelphia	.29†
Cincinnati	.265†	St. Louis	.39†
Cleveland	.185†	St. Paul	.60*
Denver	1.15‡		

*36,000 lb. †40,000 lb. ‡60,000 lb.

Railway Materials and Supplies

STEEL RAILS—Manufacturers' quotations per gross ton, f.o.b., for large mill lots:

	Pittsburgh	Birmingham	Chicago
Standard openhearth rails, 110 lb.	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	34.00	*33.00*	34@36
Re-rolled rails	24@28	*31.00*	34@36

RAILWAY TIES—For fair-sized orders, f.o.b., the following prices per tie hold:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.00	$1.20
	Creosoted—prices on application.		
Birmingham	White oak, untreated	.80	.80
	Southern pine, creosoted	1.40	1.40
Chicago	White oak, untreated	1.35	1.70
	Oak, empty cell, creosoted	1.75	2.30
	Oak, zinc treated	1.55	2.05
	Southern pine, creosoted	1.45	1.90
St. Louis	White oak, untreated	.95	1.45
	Red oak, creosoted	1.25	1.80
	Sap pine or cypress, untreated	.65	1.10
San Francisco	Douglas fir, green, untreated	.61	.82
	Douglas fir, empty cell, creosoted	1.41	*2.10*
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Manufacturers' and dealers' quotations per 100 lb. f.o.b., Pittsburgh mill, for large mill lots, together with warehouse prices at other places named:

	Pittsburgh	Chicago	Birmingham	St. Louis	San Francisco
Standard spikes, ¾-in. and larger	$2.80	*$3.45*	**$3.75**	$3.65@$3.85	$4.10
Track bolts	3.80	*4.30*	.....	4.50@ 5.00	5.10
Standard section angle bars, splice bars or fish plates	2.75	3.40	*2.25*	.....	.....

Tie plates: Price at Pittsburgh mill, $1.95 per 100 lb.

Pipe

WROUGHT-STEEL PIPE—Discounts from manufacturers' and dealers' standard lists:

	1 to 3-In. Butt Weld		3½ to 6-In. Lap Weld	
	Black	Galvanized	Black	Galvanized
Chicago, warehouse, delivered	57.3%	44.8%	53.9%	41.4%
Cleveland, warehouse, delivered	53.3%	42.3%	50.8%	37.8%
New York, warehouse, delivered	56.14%	43.6%	52.72%	40.18%
Pittsburgh, large mill lots, f.o.b.	64%	52.5%	61%	49.5%
St. Louis, warehouse, delivered	51%	38%	48%	35%

CAST-IRON PIPE—Prices of U. S. Pipe & Foundry Co., per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots of pipe:

	4-In.	6-In. and Over
Birmingham mill	*$39.00@$40.00*	*$36.00@$37.00*
Burlington (N. J.) mill	38.50@ 39.50	35.50@ 36.50
Chicago	*47.20@ 48.20*	*44.20@ 45.20*
New York	41.40	38.40
Pittsburgh	*47.80@ 48.80*	*44.80@ 45.80*
St. Louis	*45.80@ 46.80*	*42.80@ 43.80*
San Francisco	*49.00@ 50.00*	*46.00@ 47.00*

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In
Atlanta	$0.105	$0.175	$0.315	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	*.17*	*.28*	*.50*	*$0.94*	*1.79*	$3.25	5.85
Boston	.18	.28	.55	1.35	**2.38**	**3.95**	**5.90**
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.125	2.025	3.672	5.74
Cleveland	.189	.294	.567	1.35	2.43	4.824	7.38
Dallas	.23	.325	.586	1.106	1.95	3.68	5.00
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	.....
Kansas City	.21	.335	.52	1.22	1.90	3.60	.....
Los Angeles	.21	.29	.52	1.186	2.03	3.39	5.09
Minneapolis	.155	.24	.50	1.15	1.85	3.45	4.60
Montreal	.36	.53	.78	1.48	2.75	4.20	.....
New Orleans	.18	.30	.54	1.02	1.95	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.117	.182	.351	1.05	1.89	3.60	5.6375
Pittsburgh	.09	.14	.27	.75	1.35	3.024	4.8175
St. Louis	.1645	.26	.468	1.092	1.872	3.65	4.80
San Francisco	.1925	.275	.495	1.155	1.98	3.30	4.95
Seattle	.22	.30	.54	1.26	2.16	3.50	5.50

CLAY DRAIN TILE—Prices delivered by dealers, per 1,000 lin.ft.:

Size, In.	New York	Birm'ham	St. Louis	Dallas	San Fran.	Seattle
4	$45.00*	$56.00	$50.00	$63.00	$67.50	$60.00
6	80.00*	112.00	85.00	100.00	112.50	112.00

*F.o.b.

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... **$0.10** Chicago.... **$0.104** Minneapolis... **$0.107**

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.25; White, in oil, $13.25; Red, dry, $13.25; Red, in oil, $14.75.

CHEMICALS—Water, sewage treatment, road work, round lots in the New York market:

Sulphate of aluminum, in bags, per 100 lb	$1.40@$1.45
Sulphate of copper, in bbl., per 100 lb	4.00@ 4.25
Soda ash, 58%, in bags, per 100 lb	1.15@1.17½
Chlorine, cylinders, per lb	.04@ .06
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00@ 2.10
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: ⅝-in., 7-ft.; 6-in.; ½-in., 6-ft.; 1-in.; ¾-in., 4-ft., 5-in.; 1-in., 3-ft., 8-in.; 1¼-in., 2-ft., 5-in.; 1½-in., 1-ft., 8-in. Following prices are quoted by dealers per pound for ½-in. and larger:

Atlanta	*$0.19*	Kansas City	$0.25
Baltimore	.225	Los Angeles	.25
Birmingham	.26	Minneapolis	.19
Boston	*.20*	Montreal	.185
Chicago	.17	New Orleans	.25
Cincinnati	.21	New York	*.19*
Cleveland	.21	Philadelphia	.21
Dallas	.26	San Francisco	.175
Denver	.20	Seattle	.195
Detroit	*.22*	St. Louis	.175@ .18

BUILDING PAPER—Black, 50-lb. per roll of 500 sq.ft., in carloads, f.o.b., producing point $2.16

SLATERS FELT—In carloads, per roll, f.o.b., producing point $0.79

ROOFING MATERIALS—Prices, f.o.b. New York, delivered by dealers to contractors, in carloads:

Asphalt felt, per 100 lb	$3.00
Tar felt, per 100 lb	3.00
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFINGS—Prices, delivered by dealers to contractors, in carloads, f.o.b. New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	$6.12
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	6.00
Slate surfaced roofing in rolls weighing 85 to 90 lbs.	2.50

WINDOW GLASS—United inches 25, bracket size 6x8 to 10x15, single or double thickness, discount from jobbers' list at New York warehouses:
AA..... 83% A..... 89% B..... 91%

EXPLOSIVES—Manufacturers' quotations per pound for dynamite delivered in small lots—under 200 lb.:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles, f.o.b.†	$0.1875	$0.2225
Baltimore	.215	.2375	Minneapolis	.20	.225
Birmingham	.22	.245	Montreal	.20	.24
Boston	.225	*.25*	New Orleans	.195	.22
Chicago	.195*	.22*	New York	.25‡	.2725‡
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	.2125	.2475	St. Louis	.215	.235
Denver, f.o.b.	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

*Quantities above 500 lb. but less than a ton. †San Fernando Arsenal. ‡Special gelatin in case lots.

Lumber

Prices Are Per Thousand Feet, Board Measure

New York—Timbers, No. 1 Common, rough, delivered to contractor at site of job, in Manhattan, in 20 ft. lengths and under, per M. ft., b.m.:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	$52.50	$35.00
3x10 to 10x10	65.00	36.00
3x12 to 12x12	73.00	37.00
3x14 to 14x14	85.00	42.50

Chicago—Prices, f.o.b., in carloads, No. 1 Common, rough, per M. ft. b.m. For delivery to job from stock, in truckloads, add $10 per M. ft., b.m.:

	20 Ft. and Under Long-Leaf Yellow Pine	Up to 32 Ft. Douglas Fir
3x4 to 8x8	*$39.50*	*$37.50*
3x10 to 10x10	*47.00*	*37.50*
3x12 to 12x12	*58.00*	*37.50*
3x14 to 14x14	*71.00*	*38.50*

San Francisco—Douglas fir, No. 1 Common, rough, at yards. For delivery to contractor at site of job, add $5 per M. ft., b.m.:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	$30.00	$32.00
3x6 and 8	30.00	32.00
3x10 and 12	30.00	32.00
3x14	33.00	34.00

Other Cities—Delivered by dealers, No. 1 Common, rough, per M. ft., b.m.:

	8x8-In. x 20 Ft. and Under				3x12 to 12x12-In. 20 Ft. and Under	
	Pine	Fir	Hemlock	Spruce	Pine	Fir
Atlanta	*$50.00*	.....	.....	.....	$65.00	.....
Baltimore	36.00	$50.00	$53.50	$61.75	75.00	$50.25
Birmingham	53.00	.....	.....	.....	56.50	.....
Boston	*51.00*	45.00	47.00	**48.50**	*57.00*	42.00
Cincinnati	42.50	55.00	.....	.....	52.50	52.50
Cleveland	54.00	58.00	.....	.....	58.00	62.00
Dallas	55.00	57.50	55.00	55.00	55.00	50.00
Denver	.....	50.00	50.00	50.00	.....	47.00@55.00
Detroit	53.00	51.00	.....	.....	67.00	51.00
Kansas City	36.00	**38.50**	38.50	.....	**59.00**	**40.00**
Los Angeles	.....	43.50	.....	.....	.....	45.50
Minneapolis	.....	46.25	.....	.....	.....	46.25@47.75
Montreal	50.00	48.00	.....	.....	56.00	48.00
New Orleans	44.00	40.00	.....	45.00	65.00	60.00
Philadelphia	50.00	42.00	41.00	46.00	58.00	43.00
Pittsburgh	53.00	57.00	65.00	66.00	53@65	60@62
St. Louis	53.00	41.00	41.00	.....	59.50	40.00
Seattle	.....	*18.00*	.....	.....	.....	*18.00@20.00*

	1x10 In. x 16 Ft. and Under			2x10 In. x 16 Ft. T. & Gr.	
	Pine	Fir	Hemlock	Pine	Fir
Atlanta	$55.00	.....	.....	$40.00	.....
Baltimore	55.00	$44.50	$44.00	.....	.....
Birmingham	36.00	.....	.....	45.00	.....
Boston	*46.00*	40.00	42.00	*47.50*	$44.00
Cincinnati	45.00	47.50	.....	35.00	45.00
Cleveland	65.00	65.00	.....	42.00	54.00
Dallas	60.00	.....	.....	55.00	.....
Denver	40.50	38.00	38.50	.....	44.00
Detroit	47.00	44.00	.....	47.50	45.50
Kansas City	*45.00*	**37.50**	36.50	*33.25*	.....
Los Angeles	40.50	40.50	.....	.....	48.50
Minneapolis	65.00*	40.00	.....	45.00*	39.00
Montreal	56.00	.....	.....	.....	.....
New Orleans	*50.00*	*50.00*	.....	**54.00**	**48.00**
Philadelphia	52.00	42.00	40.00	53.00	42.00
Pittsburgh	43.00	50.00	55.00	40.00	50.00
St. Louis	42.00	42.00	42.00	46.00	43.00
Seattle	.....	*15.00*	.....	.....	*14.50*

*Northern Pine, No. 2 Com.

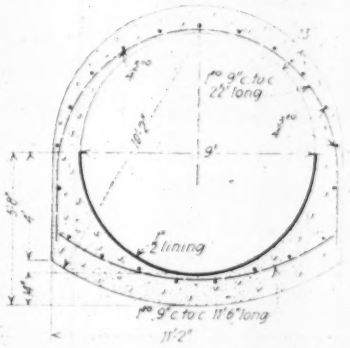
PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1¼ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	*$0.12*	*$0.165*
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	*.165*	*.215*
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	*.19*	*.235*
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	*.225*	*.345*
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	*.2425*	*.295*
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	*.305*	*.395*
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	*.345*	*.435*

Current Construction Unit Prices

Short Storm Sewer in Omaha

OMAHA, NEB., let a contract in November, 1930, for a storm sewer to cost $41,505. The construction is reinforced-concrete circular section, as shown in the drawing, of 9-ft. and 9½-ft. diameter. Concrete is either 1:2½:3½ crushed stone or 1:2½:4 gravel, quantity per foot of sewer being, for both sizes, 1.52 cu.yd. Reinforcing is mechanical bond type. Inverts are finished with a coat of 1:2 cement mortar ½ in. thick. Top of sewer is 20 to 30 ft. below the asphalt pavement of 22d St. Time to complete 100 days. Unit prices are given of the lowest three bidders: A, Gavenman Friedel Construction Co., 1611 South 53d St. (contract); B, Omaha Sewer Construction Co.; C, J. J. Hanighen Co.



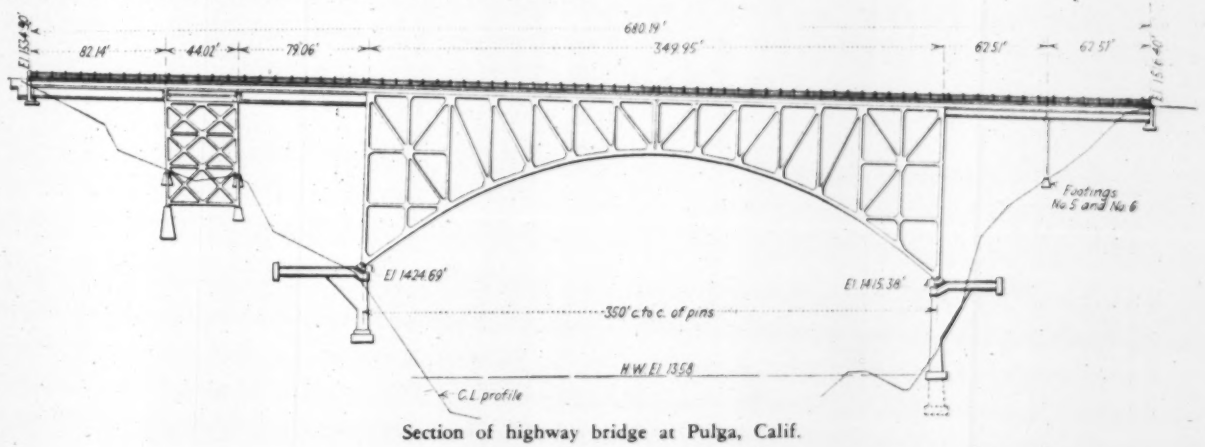
Cross-section of 9-ft. sewer

	A	B	C
792 ft. b.m. 3-in. oak for bulkhead in place, per M	$250.00	$200.00	$200.00
Reinf.-conc. monolithic sewer			
10 ft. 9½ to 9 ft., horseshoe	29.35	33.00	41.93
676 ft. 9 ft., circular	29.35	33.00	41.93
677 ft. 9½ ft., circular	29.35	31.00	37.93
2,200 lb. cast iron	.05	.05	.04
10 cu.yd. 1:4 concrete	15.00	12.00	10.00
Total	$41,505	$44,894	$56,400

Steel Superstructure for California Highway Bridge

A BRIDGE will be built across the north fork of Feather River at Pulga, Calif., consisting of six spans: A 350-ft. steel arch and plate girders 82, 79, 62.5 (two) and 44 ft. long. There will be a concrete deck 24 ft. wide. Contract was awarded in December for the superstructure, for which unit prices are given of the lowest three bidders; (A) J. H. Pomeroy Co., San Francisco, $138,848 (contract); (B) Rocca & Caletti, San Rafael, $148,760; (C) Gutleben Bros., Oakland, $158,215. Work is under supervision of the California Department of public works.

	A	B	C
590 cu.yd. concrete	$19.00	$20.00	$25.00
92,000 lb. reinforcing steel	0.046	0.05	0.06
1,540,000 lb. structural steel, in place	0702	.077	0815
55,000 lb. cast steel	0892	.12	10
59,000 lb. structural steel rail	125	10	10
34,000 lb. cast-iron rail	1035	07	06
1,000 lb. bronze expansion plates	65	45	60



Section of highway bridge at Pulga, Calif.

Grading Highway in Washington State

DIRECTOR of highways, Olympia, Wash., opened bids on Dec. 30, 1930, for grading 11.663 miles of state road No. 7, Grant County, F. A. P. 148-C, from Vantage to Burke. Seventeen contractors submitted bids ranging from $255,619 to $441,899. Unit prices are given of the lowest three: (A) Goodfellow Bros., Inc., Wenatchee (awarded contract on schedule A); (B) J. A. Terteling & Sons, Moscow; (C) General Construction Co., Inc., Seattle

	A	B	C
Clearing and grubbing (lump sum)	$75.00	$1,000.00	$750.00
181,200 cu.yd. class A excav. incl. haul of 400 ft.	.15	.50	.23
150,200 cu.yd. solid rock excav. incl. haul 400 ft.	.89	.67	.78
630 cu.yd. structure excav. incl. haul of 400 ft.	1.00	1.00	1.50
200 cu.yd. class D excav. incl. haul of 400 ft.	1.00	.40	.75
375,810 cu.yd. overhaul on above materials per each 100 ft.	.01	.02	.01
22,500 cu.yd. mile haul on borrow	.20	.20	.15
258,650 cu.yd. special borrow in place (including all haul)	.20	.175	.15
91.12 cu.yd. conc. class B in place	15.00	20.00	18.00
17,510 lb. steel reinforcing bars in place	.08	.07	.06
1,120 cu.yd. cement rubble masonry in place	8.00	10.00	9.00
35,480 cu.yd. light loose riprap in place	.50	.75	1.05
4,930 cu.yd. special loose riprap in place	.50	.75	.95
Subtotal	254,594.90	258,539.55	261,315.86
SCHEDULE A			
273 lin.ft. standard reinf. conc. pipe 18 in. diam. in place	2.50	2.50	2.50
36 lin.ft. standard reinf. conc. pipe 24 in. diam. in place	3.50	3.50	3.50
48 lin.ft. standard reinf. conc. pipe 30 in. diam. in place	4.50	5.50	5.50
Subtotal schedule A	$1,024.50	$1,072.50	$1,072.50
SCHEDULE B (Alternate)			
273 lin.ft. corr. iron pipe 18 in. diam. in place	$2.50	$2.00	$2.25
36 lin.ft. corr. iron pipe 24 in. diam. in place	3.50	3.00	3.00
48 lin.ft. corr. iron pipe 30 in. diam. in place	4.50	4.00	4.50
Subtotal schedule B	$1,024.50	$946.00	$993.25
Total schedule A	$255,619	$259,612	$262,388
Total schedule B	255,619	259,386	262,254

Grading and Draining Road in Arizona

STATE highway commission, Phoenix, Ariz., opened bids on Jan. 5 for grading and draining 13.7 miles of the Globe-Safford highway, F. A. P. 87-E, including sixteen bridges. Six bids were received and contract was let to Robert E. McKee, 1918 Texas St., El Paso, for $167,812. A. O. Peabody, Hatch, N. M., submitted the other low bid, $168,196.

	A	B
12,425 cu.yd. roadway excav. (unclass.)	$0.22	$0.19
12,520 cu.yd. drainage excav. (unclass.)	.23	.21
2,454 cu.yd. structural excav. (unclass.)	.70	.80
93,146 cu.yd. borrow excav. (unclass.)	.19	.165
762 sta. yd. overhaul earthwork	.05	.05
958 cu.yd. class A conc.	19.50	20.00
209 cu.yd. class B conc.	20.40	18.50
492 cu.yd. class A conc. fords	15.00	15.00
171 cu.yd. class B conc. fords	20.00	18.50
72,339 lb. rein. steel	.046	.04
60 lin.ft. 18-in. corr. metal pipe	1.75	1.80
674 lin.ft. 24-in. corr. metal pipe	2.70	2.50
460 lin.ft. 30 in. corr. metal pipe	3.40	3.00
312 lin.ft. 36-in. corr. metal pipe	5.40	4.70
278 lin.ft. resetting 24-in. corr. metal pipe	.60	.60
146 lin.ft. resetting 30-in. corr. metal pipe	.85	.75
164 lin.ft. resetting 36-in. corr. metal pipe	1.10	1.00
2,950 lin.ft. cable road guard	.85	.80
62,288 lin.ft. reconstruct fence	.04	.03
200 lin.ft. bank protection type A	2.95	5.00
165 lin.ft. bank protection type B	1.60	2.50
40 lin.ft. bank protection type C	4.10	7.00
180 lin.ft. bank protection type D	4.85	6.00
Removal of trees	200.00	100.00
30 cu.yd. removal of old conc.	3.60	3.00
Structures Over 20-Ft. Clear Span		
2,367 cu.yd. drainage excav. (unclass.)	.23	.21
4,255 cu.yd. structural excav. (unclass.)	.90	1.30
67 cu.yd. class AA conc.	60.00	60.00
2,720 cu.yd. class A conc.	19.00	20.00
314 cu.yd. class B conc.	18.65	18.50
304,740 lb. rein. steel	.046	.04
2,768 lin.ft. conc. piles	3.95	4.80
32 plate bridge seats	10.00	2.00
32 expansion rocker bridge seats	50.00	40.00
8 cu.yd. removal of old conc.	3.60	3.00

Wards Island Anchorage of Triborough Bridge, New York

TRIBOROUGH bridge in New York City extends from the west end of Long Island (Queens) across Hell Gate in the East River to Wards Island, across Little Hell Gate to Randalls Island and across Bronx Kills to the Bronx, with a connection to Manhattan from the main bridge over Randalls Island to East 125th St., a total length of 17,710 ft. Full details were given in *Engineering News-Record*, Oct. 17, 1929, p. 622. The crossing at Hell Gate is a 1,380-ft. suspension span with 135-ft. clearance above mean high water. Total estimated cost for the entire project is $32,000,000. E. A. Byrne is chief engineer of the department of plant and structures, New York.

The first contract to be let was for a tower foundation in Queens Borough and a tower foundation and seventeen pier foundations on Wards Island. This was awarded in November, 1930, to Arthur McMullen Co., 50 Church St., for $706,000. The Wards Island anchorage has now been awarded (January) to Bersin-Romm, Inc., 11 West 42d St., for $617,955. The Queens anchorage was submitted to the board of estimate for approval Jan. 19; estimated cost $900,000.

Work under Bersin-Romm contract consists of earth and rock excavation, the construction of the masonry cores of the anchor, buttresses and connecting walls, furnishing and erecting the anchor girders and chains, setting bolts for cable bents, and other work. Excavation amounts only to 3½ per cent of the cost, and the unit prices vary widely; from $0.35 to $4 for 6,800 cu.yd. earth; $2.50 to $7.50 for rock. The low price in each case is that of the successful contractor. Concrete masonry and structural steel items account for 92 per cent of the contract price. There are 59,000 cu.yd. of concrete, $6.40@$9 per cubic yard. The steel was bid lump sum. The only other comparable unit prices are of 330,000 lb. reinforcing steel, and dowels and 4,000-lb. cast-iron pin caps and separators. Unit prices are given below for these four items:

	A	B	C	Average 17 Bids
Concrete masonry, 1:2:4	$6.40	$7.50	$7.27	$8.80
Reinf. steel and dowels not galv.	.03	.06	.054	.04½
Galv. dowels and ladder rungs	.05	.07	.066	.08½
C.-i. pin caps and separators	.09	.10	.10	.184
Struct. steel, lump sum	195,000	151,438	179,600	163,913
Total	$618,855	$669,938	$686,895	$880,000

The bidders: A, Bersin-Romm; B, Arthur McMullen Co.; C, Corbetta Concrete Corp.

Sewer Items at Peoria, Ill.

GREATER PEORIA sanitary and sewage-disposal district let a contract in October, 1930, for the northern section of intercepting sewers and appurtenances known as division H, which includes 16,500 ft. of 12- to 30-in. pipe in open cut and tunnel, under railroad tracks, buildings and pavements. Work includes wet and dry excavation, backfilling, disposal of excess material, placing concrete, brickwork, sewers, iron pipes and castings. The contractor is the Northern States Improvement Co., Endicott Bldg., St. Paul, $123,198. The engineers are Pearse, Greeley & Hansen, Chicago. Proposals were asked on (A) vitrified tile pipe; (B) reinforced-concrete pipe; (C) segmental tile, and (D) cast-iron pipe under several items. Vitrified pipe is in lengths of 2 ft. or more, and the joints are cemented. Segmental tile has interlocking joints. Reinforced-concrete pipe is of class A concrete—8 gal. water per sack of cement, slump 4 to 8 in. Unit prices are given on typical items of the lowest three bidders on the whole job.

Item 5 is for 1,709 lin.ft. of 30-in. sewer in tunnel or open cut with 16 to 18 ft. of cover.

	1	2	3
Alt. A, vit. tile	$8.65	$14.00	$17.70
Alt. B reinf. concrete	8.90	15.00	17.75
Alt. C seg. block	.....	16.00	17.70

Item 9 is for 644 ft. 15-in. with 5 ft. cover.

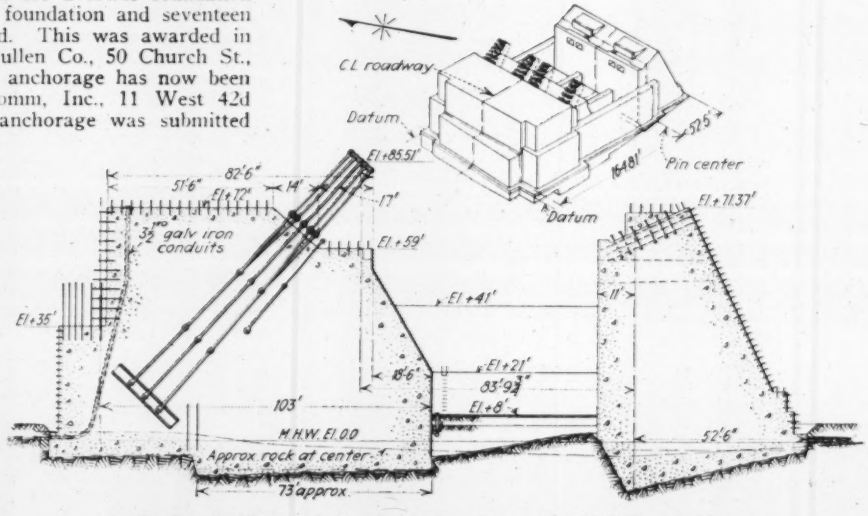
Vit. tile, 15-in.	$1.90	$1.65	$1.48
Cast iron, 14-in.	4.12	3.80	3.11

Item 11 is for 855 ft. 30-in. in tunnel.

Vit. tile	$17.20	$15.00	$15.70
Concrete	17.50	15.50	15.75
Seg. block	.....	15.50	15.70

Item 12 is for 224 ft. 24-in. in open cut with 6 to 17 ft. cover.

Vit. tile	$3.18	$4.00	$4.03
Concrete	3.48	4.50	4.35



Sectional and perspective views of anchorage for Hell Gate bridge

CONSTRUCTION NEWS

CONTENTS

Engineering Structures:	Page
Airports	94
Bond Elections	94
Bridges	92
Dams	95
Equipment	96
Excavation	94
Federal Government	94
Foreign	95
Grade Crossings	94
Heating and Ventilating	95
Materials	95
Parks and Sports	95
Piers and Wharves	94
Power and Lighting	95
Sewers	91
Streets and Roads	92
Waterworks	89
Unclassified	95
Industrial Buildings	
Factories and Mills	98
Garages	99
Power Plants	99
Shops and Foundries	99
Warehouses	99
Commercial Buildings	
Banks	97
Churches	97
Clubs	96
Hospitals	96
Offices	98
Public	98
Residential	96
Schools	97
Stores	98
Theatres	98
Unclassified	98

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	Project	Cost	Status
Waterworks			
Springfield (Ill.)	Water supply	$2,500,000	Proposed
Boston	Water tunnel		Bids asked
Vancouver (B.C.)	Water tunnel	1,000,000	Proposed
Sewers			
Chicago	Sewage treatment Works	2,704,098	Contract
Dallas (Tex.)	Sewers	1,500,000	Bids asked
Bridges			
Los Angeles	Viaduct	1,620,000	Proposed
Sports and Parks			
Jersey City	Stadium	2,000,000	Proposed
Power Plants			
Long Beach (Calif.)	Power Plant	7,500,000	Contract
Buildings			
Princeton (N.J.)	Hotel	1,000,000	Contract
Trenton (N.J.)	Church	1,000,000	Proposed
Springfield (O.)	Hospital	1,500,000	Bids asked
Hackensack (N.J.)	County Building	1,200,000	Bids asked
Newark (N.J.)	High School	1,000,000	Proposed
New York	High School	1,015,000	Contract

WATERWORKS

PROPOSED WORK

Ala., Bayou Labatre—S. A. Warner, Ashland Pl., Mobile, extensions, additions to waterworks plant.

Calif., Upland—Water Dist. 9, water supply system, incl. deep well, booster pumping plant, pipe line, reservoir. $45,000.

Colo., Walsenburg — City, c/o A. Merritt, mayor, 6 mi. 18 in. c.i. pipe line. $140,000. Douglas, Corey & Fisk, Walsenburg, engrs.

Conn., Meriden — Waterworks extensions. $80,000 bond issue authorized for same. C. P. Prann, City Hall, engr.

Ill., Springfield—City Council soon takes bids new impounding lake water supply. $2,500,000 bonds—sold for same. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs. Noted July 3.

Kan., Fulton—Preliminary plans waterworks improvements, extensions. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Mass., Chelmsford — Town, sketches, waterworks. To exceed $15,000. Metcalf & Eddy, Statler Bldg., Boston, engrs.

Mass., Falmouth — Town, new pump for pumping station. $22,000 appropriated. Engineer not selected.

Mass., Norwell—Town, sketches waterworks. To exceed $15,000. Symonds & Stevens, 70 State St., Boston, engrs.

Mass., Paxton—Town, sketches new waterworks. To exceed $15,000. H. A. Symonds, 70 State St., Boston, engr.

Mass., Provincetown—Town, Bd. Selectmen, mains, standpipe. $125,000.

Mass., Quincy — Waterworks improvements. $249,336 appropriated.

Mass., Raynham — Town, Bd. Selectmen, water supply, incl. mains, hydrants, pumping station. $200,000. Whitman & Howard, 89 Broad St., Boston, engrs. Noted Nov. 20.

Mass., Reading—Town, P. Wks. Dpt., 1 story, brick pumping station, near Grove St. $50,000. Architect not selected.

Mass., Russell — Town, storage reservoir. $60,000. Tighe & Bond, 189 High St., Holyoke, engrs.

Mass., Springfield — City, Waterworks Dpt., City Hall, reservoir addition, Provin Mountain, in Southwick. $300,000.

Mass., Townsend—Town, waterworks. $170,000. Parker, Bateman & Chase, High St., Clinton, engr. Noted Mar. 6, 1930.

Mass., Wakefield—Town, Water Bd., c/o S. F. Adams, 128 Pleasant St., driven well sand pumping station for town's water supply. $40,000. Weston & Sampson, 14 Beacon St., Boston, engrs. This corrects report in Feb. 5 issue.

Me., Portland—Portland Water Dist., J. W. Graham, 16 Casco St., pipe line from here to Sebago Lake. To exceed $15,000. Private plans.

N. Y., New York—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., pumping plant, equipment for transfer of water from Croton Reservoir to Ashokan Reservoir. $500,000. Maturity in April or later. J. J. Dietz, comr.

Pa., Seneca—Village, 1 to 1.5 mi. 6 in. c.i. pipe, necessary equipment, incl. pump for new water line. W. P. Ferringer, South Side Star Route, Oil City, in charge. Private plans.

Tex., Edinburg—Central Power & Light Co., Natl. Bank of Commerce Bldg., San Antonio, waterworks improvements here and at McAllen and San Benito, incl. new pumping equipment, pipe for distributing systems. Private plans.

Tex., Point Isabel—City, c/o G. Scanlon, mayor, soon takes bids complete waterworks and sewerage systems. $135,000. H. E. Elrod, Petroleum Bldg., engr. Noted Nov. 20.

Wyo., Evanston—City, 1 m.g. covered rein.-con. reservoir. $30,000. C. J. Ullrich, Salt Lake City, Utah, consult. engr.

B. C., Vancouver—Greater Vancouver Dist., 500 Beatty St., bids in May, pressure tunnel to carry water under the 1st Narrows, Burrard Inlet, length 3,100 ft. x 7 ft. 6 in., with 400 ft. x 8 ft. riser wells at each end, in solid rock, and steel main at Stanley Park end across park. $1,000,000. E. A. Cleveland, 500 Beatty St., engr.

Ont., Wiarton—Village installing waterworks, incl. c.i. mains, services, valves, hydrants, electric pumps, reservoir, standpipe. $25,000 up. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs.

BIDS ASKED

Mass., Boston—Mar. 27, by Metropolitan Dist. Water Supply Comn., 20 Somerset St., Coldbrook-Swift Tunnel, 10 mi. long, appurtenances, incl. 4 shafts, excavation of portal and intake cuts, constructing intake control works in towns of Barre, Hardwick and Greenwich. F. E. Winsor, ch. engr. comn.; adv. E. N.-R. Mar. 5.

N. Y., Brooklyn—Mar. 10, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, water-mains, appurtenances in New York and Utica Aves., Carroll and President Sts.

N. Y., Dannemora—Mar. 24, at office Dpt. Correction, W. N. Thayer, Jr., Comn., State Office Bldg., Albany, furnishing, delivering f.o.b. Dannemora, c.i. pipe, fittings for proposed water line for Clinton Prison and Dannemora State Hospital; adv. E.N.-R. Mar. 5.

N. Y., Long Island City—Mar. 10, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Kissena, Parsons, and Willets Blvds., Vernon, 36th, Ash, Barclay, Beech, Delaware, Franconia, Franklin, Geranium, Hawthorn, Holly, Juniper, Kalmia, Laburnum, Negundo, Oak, Queens and Rose Aves., Main, Union Bowne, Burling, Robinson, Smart and Union Sts.

N. Y., New York—Mar. 10, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., installing steam piping, appurtenances at Millburn Pumping Station, Baldwin; hauling, setting additional valves, removing and replacing defective and obsolete valves on existing mains, Manhattan Boro.

O., Steubenville—Bids about Apr. 19, extending waterworks to west end of city, incl. installation dual system watermains, constructing pumping station, tank, purchasing, installing pumps and other equipment. $75,000. J. K. McGinnis, Steubenville, engr.

Pa., Graterford—Mar. 6, by Day & Zimmermann Eng. & Constr. Co., 112 North Broad St., Phila., pumping unit, for Trustees Eastern State Penitentiary.

Pa., Pittsburgh—Mar. 10, by R. G. Woodside, controller Allegheny Co., furnishing, laying 7,200 lin.ft. 8 in. bell and spigot c.i. water pipe, 600 lin.ft. 6 in. corrugated galvanized metal pipe conduit furnishing, welding, laying 3,000 lin.ft. 6 in. plain end, wrought steel gas line, for municipal airport, Mifflin Twp., near here. $24,000. E. A. Griffith, 519 Smithfield St., engr.

Tex., Wichita Falls—City Comrs., Montgomery & Ward, engrs., Wichita Falls and Black & Veatch, engrs., Mutual Bldg., Kansas, Mo., taking bids and open same about Mar. 15, 26,000 ft. 42 in. conduit line, $275,000; distribution system, incl. 75,000 lin.ft. 4- to 16-in. alternate classes pipe, fire plugs, etc. $300,000. Election Mar. 14, $1,000,000 for waterworks improvements. Noted Jan. 1.

Wash., La Conner—Apr. 1, by City Council, purchasing present system, and improving same, incl. 25,000 ft. 6 in. pipe, 200,000 gal. reservoir or tank. $45,000. W. C. Morse, Inc., Smith Tower Bldg., Seattle, engrs. Noted Dec. 25.

Wash., Wentachee—City Comrs., bids about Mar. 17, waterworks improvements, incl. 1,400,000 to 4,000,000 gal. reservoir, 3,760 lin.ft. mains and 160 services installed. $106,000.

Que., Cap de la Madeleine—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Hayward—City, rein-con. reservoir, to Jones & King, Hayward. $10,580. Noted Jan. 15.

Calif., Lompoc — City Council, to Standard Pipe & Supply Co., 441 Santa Fe Ave., Vernon, furnishing asphaltum dipped lap welded black steel pipe, 2,800 ft. 8.325 in. O. D. x 8.249 in. I. D. at $0.675 per ft., 100 ft. 8 in. O. D. x 7.628 in. I. D. $0.69, 600 ft. 7 in O. D. x 6.625 in. I. D. $0.55. Noted Jan. 29.

Ill., Chicago—Bd. Local Impvts., City Hall, c.i. water supply pipes, special castings, c.i. valves, brick valve basins in West 82nd Pl., South Knox, South Oakley, and Woodlawn Aves., to J. J. Callahan, 3139 Indiana Ave.; in West 83rd St., to S. Ryan, 2927 West Congress St.; East 85th St., Merrill, Clyde and Chappel Aves.; to M. J. Bohan, 1105 West Garfield Blvd.

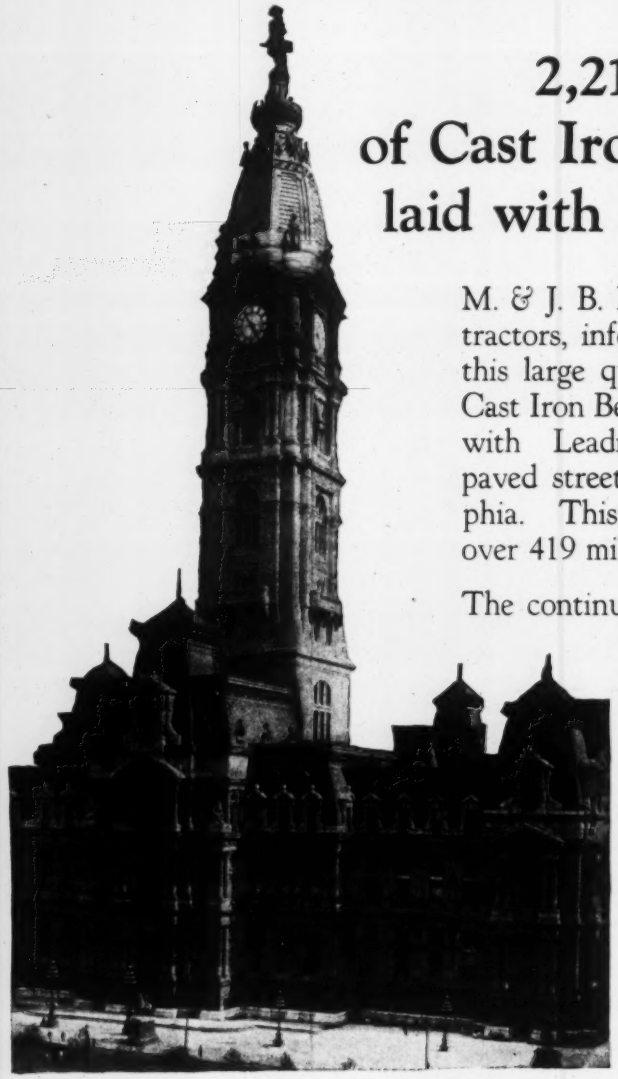
Ky., Cloverport—O. E. Ferguson, mayor, complete waterworks, incl. materials, wells, pumps, reservoir, hydrants, to C. W. Farley, 1 South 5th Ave., La Grange, Ill., $60,000. This corrects report in Feb. 26 issue.

Ky., Columbia—City Council, complete waterworks, incl. 2- to 8-in. c.i. pipe, filter plant, buildings, pumps, to Pittsburgh-Des Moines Steel Co., 38 South Dearborn St., Chicago, Ill., $56,000.

See proposal advertising on page 150

Const. News page 89

LEADITE



2,212,853 ft. of Cast Iron Water Mains laid with LEADITE Joints

M. & J. B. McHugh, well known contractors, inform us that they have laid this large quantity of various sizes of Cast Iron Bell and Spigot Water Mains with Leadite joints—mostly under paved streets of the City of Philadelphia. This total footage amounts to over 419 miles of pipe.

The continuous use of Leadite by this old established contracting firm over a long period of years is certainly indicative of the efficiency and complete satisfaction to them and the Engineers in charge.

Thousands of miles of water mains in this Country and Overseas Countries are jointed with LEADITE.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa

No Caulking

Waterworks (Continued)

La., Hammond—City Council, furnishing 1,000 gal. dual drive fire pumps, to A. M. Lockett & Co. Ltd., Q. and C Bldg., New Orleans, $4,160; pipe, fittings, to Dixie Mill Supply Co., 901 Tchoupitoulas St., New Orleans, $3,491; installation pipes and pumps, to Walker Bros., San Antonio, Tex., $3,370. Grand total $11,021. Noted Jan. 22.

La., Opelousas—City Council, furnishing, installing one 950 to 1,000 hp. vertical or horizontal multi-cylinder Diesel or gas engine, 2 or 4 stroke cycle, air or mechanical injection, incl. motor operation generator, exciter switch-filter with piping centrifuge and direct connected alternator and exciter of 650 kw., to Busch Sulzer Bros. Diesel Engine Co., 3300 South 2nd St., St. Louis, Mo., $48,990; switchboards, to General Electric Co., Union Indemnity Bldg., New Orleans, $878. Noted Jan. 29.

Mass., Chicopee — City Water Dpt., F. B. Cobb, city engr., filtration plant at Cooley Brook, to W. T. Dinneen, Goodridge St., Lynn, $186,123. Est. $200,000. Noted Jan. 22.

N. H., Concord—City Water Comn., Soucook River Pumping Station, to Norquist Constr. Co., Inc., 80 South Main St., $33,698. Noted Feb. 5.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Remsen Ave., to Ozone Park Water Pipe Constr. Co., 96-29 Rockaway Blvd., Ozone Park, $6,400. Noted Feb. 19.

N. Y., Buffalo — City, G. S. Minnis, 1036 Ellicott Bldg., watermain changes in connection with elimination of Amherst-Austin-Tonawanda Sts. Grade Crossing, to D. W. Brown Co., 3000 Delaware Ave., Kenmore, $20,949. Noted Jan. 22.

N. Y., New York—J. J. Dietz, comr. Water Supply Gas & Electricity, Municipal Bldg., mains in Barnes Ave., to Sareno Contg. Co., 1957 Colden Ave., $18,700.

Tex., El Paso—City, earth work and incidental structures for Brown St. Reservoir, incl. 101,000 cu.yd. earth excav., rolled in dams and some pipe line and small concrete structures, to G. Orr, R. F. D. 1, Box 127, $32,000. Noted Dec. 11.

Que., Cap de la Madeleine—Municipal Council, 15 x 60 x 100 ft. concrete reservoir (under lake level) and 6- to 14-in. Class C c.i. mains, day labor $115,000. R. Morissette, engr.

Que., Hull—E. B. Eddy Co. Ltd., new filtration plant, to Foundation Co. of Canada Ltd., 1538 Sherbrook St. W., Montreal, and Ottawa, $400,000. Noted Dec. 18.

SEWERS

PROPOSED WORK

Calif., Santa Monica—For 1.5 mi. 15 and 18 in. vitr. clay sewers. H. B. Carter, city engr.

Conn., Unionville—Sewerage system, sewage treatment works. $240,000. T. F. Bowe, 110 William St., New York, consult. engr.

Ind., Mitchell—City Council sanitary sewerage system. $50,000. C. H. Hurd, 518 North Delaware St., Indianapolis, engr. Noted Sept. 4.

Ind., South Bend—Bd. P. Wks., soon takes bids intercepting sewers, sewage treating plant. Burns & McDonnell Eng. Co., 406 Interstate Bldg., Kansas City, Mo., engrs. Noted Aug. 28.

Minn., Fairmont — City, G. Ansteth, clk., sewage disposal plant. $80,000. C. Foster, Sellwood Bldg., Duluth, engr.

Mass., Swampscott — Town, Bd. Selectmen, sewerage improvements. $65,000 appropriated.

Mo., Sedalia — Sewage disposal plant. To exceed $25,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, engr.

N. J., Allenwood — Bd. Boro Council, Boro Hall, does not plan a sewage disposal plant. $50,000. L. Cubberly, 210 Bway., Long Branch, engr. This corrects report published in Feb. 26 issue.

N. J., Burlington—Mayor and City Council soon take bids sewage disposal plant, pipe line. $170,000. B. Sleeper, city engr. Noted Dec. 11.

N. J., Ocean Grove—Ocean Grove Camp Meeting Assn., M. E. Snyder, in charge, will not build steel, rein.-con. sewage disposal plant. $25,000. Project abandoned. Noted Mar. 27.

N. J., South Amboy—Bd. City Council, City Hall, sewage disposal plant. $25,000 or more. Maturity about May. Engineer not selected. Noted Feb. 12.

Pa., Williamsport—For 1,000 ft. 24 in. and 1,000 ft. 15 in. terra cotta sewers in Chestnut St. L. Mussina, city engr.

Tex., Houston — City, A. Monteith, mayor, soon takes bids North Main St. and 20th Ave. Storm Sewer Project. $175,000.

Ont., Kitchener—City, 12,000 ft. 24- to 36-in. rein.-con. storm sewers in Mill and Borden Sts. and in West Ward. $52,000. S. Shupe, City Hall, engr.

BIDS ASKED

Calif., Redwood City — Mar. 16, by Bd. Supervs. outfall sewer for Lomita Park, San Bruno, and Capuchino (into San Francisco Bay). To exceed $100,000. R. A. Klassen, Courthouse, engr. Noted Aug. 28.

Ill., Chicago—Mar. 12, by J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Sewage Treatment Works, Div. CC, consisting separate sludge digestion unit, incl. 2 plain digestion tanks each 35 ft. deep, one 40 ft., other 50 ft. diam. equipped with digestor mechanism, 2 sludge storage tanks 37 ft. deep, 20 ft. diam., control house with superstructure, 37 ft. deep, 25 ft. diam., boiler house with superstructure, piping, pumps, ejectors, equipment, in village and township of Stickney.

Ill., Chicago—Mar. 19, by J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., California Avenue Outfall Sewer, Contr. 1, in Blue Island, Worth Twp.; adv. E. N.-R. Mar. 5.

Ill., Dupo — City Council taking bids 29,380 ft. 8- to 15-in. vitr. clay sewers, 928 Y junctions, 96 brick manholes, 4 brick drop manholes, rein.-con. outfall basin, brick pumping station, 10,140 lb. special castings, two 5 in. vertical centrifugal pumps. $90,376. Sheppard, Morgan & Schwaab, Faulstitch Bldg., Alton, engrs. Noted Aug. 7.

Kan., Topeka—W. E. Baldry, city engr., bids about Mar. 5, 8- to 18-in. sanitary sewers in Oakland Addition. $90,000. This corrects report in Feb .12 issue.

Ky., Louisville—Mar. 12, by Commissioners of Sewerage, 400 M. E. Taylor Bldg., Deer Park Ave., Trunk Sewer, Contr. 53, 3,672 ft. open trench, 956 ft. rock tunnel, 33- to 42-in. plain or rein.-con. circular sewer, manholes, junctions, appurtenances. W. M. Kaye, M. E. Taylor Bldg., technical engr.

Md., Baltimore — Mar. 11, by Bd. Awards, sanitary sewer as embraced in Sanitary Contr. 274. M. J. Ruark, Municipal Bldg., sewerage engr.

N. Y., Brooklyn—Mar. 9, by M. Cosgrove, comr. Docks, Pier "A", Battery Pl., New York, sewage disposal system, plumbing and water supply, electrical work and heating, oil burnings plants at Municipal Airport (Floyd Bennett Field), Contr. 2028.

N. Y., New York—Mar. 11, by W. J. Flynn, acting pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Balcom, Waterbury and Buhre Ave,

O., East Columbus — Mar. 13, by W. T. Leffler, village clk., 13,500 ft. 8 and 10 in. vitr. clay sanitary sewer in Dist. 2. $65,000. Jennings-Lawrence Co., Hartman Bldg., Columbus, engrs.

Pa., Williamsport — Taking bids sewers, vitr. brick on concrete paving Wayne and 5th Aves., Court, DuBois and Laurel Sts. $30,000-$40,000. L. Mussina, city engr.

Pa., Williamsport—Mar. 10, by City Council, excavating, furnishing, laying 2,000 lin.ft. 24 in. vitr. clay pipe in Annie Valley, Chestnut, Wyoming and Meade Sts. $25,000 to $30,000. L. Mussina, Williamsport, engr.

Tex., Dallas — Mar. 11, by City, c/o E. Goforth, secy., constructing storm sewers in Dallas Branch, incl. Pacific Ave., $700,000; Peaks Branch, $450,000; Mill Creek, $350,000. Total est. $1,500,000. J. M. Young, city engr. Benham Engr. Co., 1106 Perrine Bldg., Oklahoma City, Okla., consult. engrs.

Tex., Galveston—Mar. 12, by City, c/o F. A. Quin, aud., 58,850 ft. 8- to 12-in. vitr. tile or concrete sewers and 155 manhole covers in area south of Avenue J, west of 47th St. and north Avenue J between 38th and 46th Sts. Noted Nov. 20.

CONTRACT AWARDED

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., 8- to 12-in. vitr. sewers with and without concrete cradle in Hanover St. et al., County Impvt. 928, to Gogo & Rados, 10024 South Figueroa St., $56,965. Noted Jan. 29.

Calif., National City—City Council, sanitary sewerage system, rein.-con. septic tank, 4- to 12-in. concrete pipe, to Drainage Constr. Co., 12,240 Bellevernon Ave., Lynwood, $98,815.

Ill., Chicago—R. A. Woodhull, chn. committee Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Sewage Treatment Works Div. Z- Imhoff tanks, Battery C, to S. A. Healey Co., 6561 East Seven Mile Rd., Detroit, Mich., $2,704,096. Noted Dec. 25.

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., alterations to sludge drying beds at Calumet Sewage Treatment Works, Div. L, to T. J. Pendergast Co., 192 North Clark St., $8,768.

Ia., Tama — C. E. Davis, city clk., 653 ft. rein.-con. box sewer 11 ft. wide, 6.5 ft. high inside dimensions, 4 inlets, to W. B. Carter, Sioux City, $14,435. Noted Feb. 5.

La., New Orleans — Sewerage & Water Bd., 526 Carondolet St., Contr. 210-S, installing vertical trash pumps at Stations 2 and 6, to H. P. Farnsworth, Canal Bank Bldg., 17th and Canal Sts., $13,700; Contr. 209-S, furnishing valves for vertical trash pumps at Stations 2, 6 and 7, to Michigan Valve & Fdry. Co., 3631 Parkinson St., Detroit, Mich., $10,226; Contr. 208-S, furnishing vertical trash pumps and corrugated iron piping for Stations 2, 6 and 7, and Contr. 120-D, furnishing parts for constant duty pumps at Stations 5 and 9, to Hardie-Tynes Mfg. Co., 800 North 28th St., Birmingham, Ala., $31,398 and $7,930 respectively. Grand total $63,254. Noted Dec. 18, under "Waterworks."

Md., Baltimore—Bd. Awards, storm sewers in Sewer Dist. 37-A as embraced in Storm Water Contr. 154, to W. H. Thompson, Relay, $11,092. Noted Feb. 5.

Md., Baltimore—Bd. Awards, sanitary sewers, storm drains as embraced in Storm Water Contr. 162, to N. Martell, 4400 Vesta Ave., $38,002.

Mass., Braintree — Town, E. Avery, chn. Selectmen, Contr. 1, vitr. clay sewerage system, to Woosdum Coal Co., 38 Crescent Ave., $73,684; Contr. 2, iron manhole castings, to LeBaron Fdry. Co., Brockton, $2,634; Contr. 3, c.i. pipe, to Warren Fdry. & Pipe Co., 201 Devonshire St., Boston, $8,700; Contr. 4, laying 16,000 ft. sewer pipe in East Braintree to L. Balboni, 78 Metropolitan Ave., West Roxbury, $97,152. Grand total $182,170. Noted July 24.

Mich., Detroit—Dpt. P. Wks., monolithic concrete sewer in tunnel, Burlington Dr. arm north of Seven Mile Rd., to G. Sommerville, 5578 Martindale Ave., $10,832; Gloucester Dr. arm north of Seven Mile Rd., to B. Cornacchio, 17644 St. Louis Ave., $11,399; Freud Ave. arm east of Lycaste, to Blanck & Gargaro, 40 Seven Mile Rd. E., $14,495. Grand total $36,726.

Minn., Biwabik — Village, sewage disposal plant, day labor. $40,000. J. C. Taylor, Hibbing, engr. One third work to be done this year, rest in 1932 and 1933.

New Jersey—Joint Meeting Village South Orange, Roselle, Park Boro, Cities of East Orange, Newark, Summit, Towns Irvington and West Orange, Maplewood, Millburn and Union Twps., City Hall, Newark, section joint sewer in Roselle Park to Union Ave., Union, to Yetman & Garofalo, Real Estate Trust Bldg., Phila., Pa., Sect. A $475,459, Sect. B $456,523; to Thomas Burke & Co., Widener Bldg., Phila., Pa., Sect. C $499,913, Sect. D $445,865. Grand total $1,877,760. Noted Jan. 22.

N. J., Long Beach—Twp. Comn., Township Hall, furnishing, delivering 12 and 24 in. pipe and 12- to 24-in. terra cotta pipe, manholes for storm water drain on Long Beach Blvd., to Beach Haven Plumbing Co., Beach Haven. Est. $25,000. Noted Feb. 12.

N. Y., Elmsford—Village Clerk, 1 mi. 15-18 in. vitr. sewer in White Plains-Tarrytown Rd., to Roach-Thompson Corp., 8 Exchange St., Rochester, $72,985. Noted Jan. 29.

N. Y., Mamaroneck—Westchester Co. Sanitary Sewer Comn., E. S. Martin, Secy., Court House Annex, White Plains, Saw Mill River Sewer, Sect. O to La Rocca Construction Co., 59 East 161st St., New York, $384,835.

O., Cleveland—For Walworth Run diversion connection at Scranton Rd. to West 2nd St. and University Rd., 5,647 ft. 3, 4 and 5 ft. circular "E" pipe, to A. L. Connelly Co., 1900 Euclid Bldg., $264,858; 230 ft. 12 in. tunnel and 1,850 ft. 12 in. concrete intercepting sewer in West 12th and West 11th Sts., to Curro & Whittaker, Standard Bank Bldg., $19,443; sewers in Beachwood Ave., to A. F. Bardsley, Clague Rd., $6,159. Grand total $290,460.

Okla., Tulsa — E. Logan, city aud., Zion Place Storm Sewer, Project 14-30, to W. B. Carter, 7 North Rockford St., $28,876; Lindell Park Sewer, Project 1-B-3, to C. M. Brown, 1315 South Trenton St. $35,506; Project 8-30, to Howard Frye & Co., 1111 South Florence Pl., $22,275. Grand total $86,657.

Okla., Tulsa—City Comn., general contract sewage disposal plants Coal and Flat Rock Creeks, to Smith-Lyons Co., Exch. Nat. Bank Bldg., $109,680. Noted Dec. 4.

Tex., Austin — City, A. R. Johnson, mgr., 6,000 ft. storm sewers in vicinity East 3rd St., and 6,000 ft. 15- to 54-in. monolithic concrete storm sewers in East 6th St. and Baton Spas Rd., to Klein Bros., 422 North Walton St., $33,641 and $23,415 respectively. Est. $40,000 and $30,000 respectively. Noted Feb. 12.

Tex., Dallas—At office E. Goforth, city secy., constructing Tuttle Creek Sanitary Sewer, to McKenzie Constr. Co., Construction Bldg., $127,833.

Ont., Ottawa—Secretary Bd. Control, rebuilding sewers damaged by explosion, to Grant Bros., Natl. Bank Bldg., McLaughlin Bros., Wilten Crescent, and W. J. George, 51 Irving Ave. Est. $150,000. Noted Feb. 5.

BRIDGES

PROPOSED WORK

Calif., Los Angeles — City Council probably takes bids in March, Sixth Street Viaduct, incl. 3,600 ft. bridge proper, 46 ft. wide at approaches 56 ft. rein.-con. girder span with structural steel river span. $1,620,000. M. Butler, city bridge engr. Noted May 29.

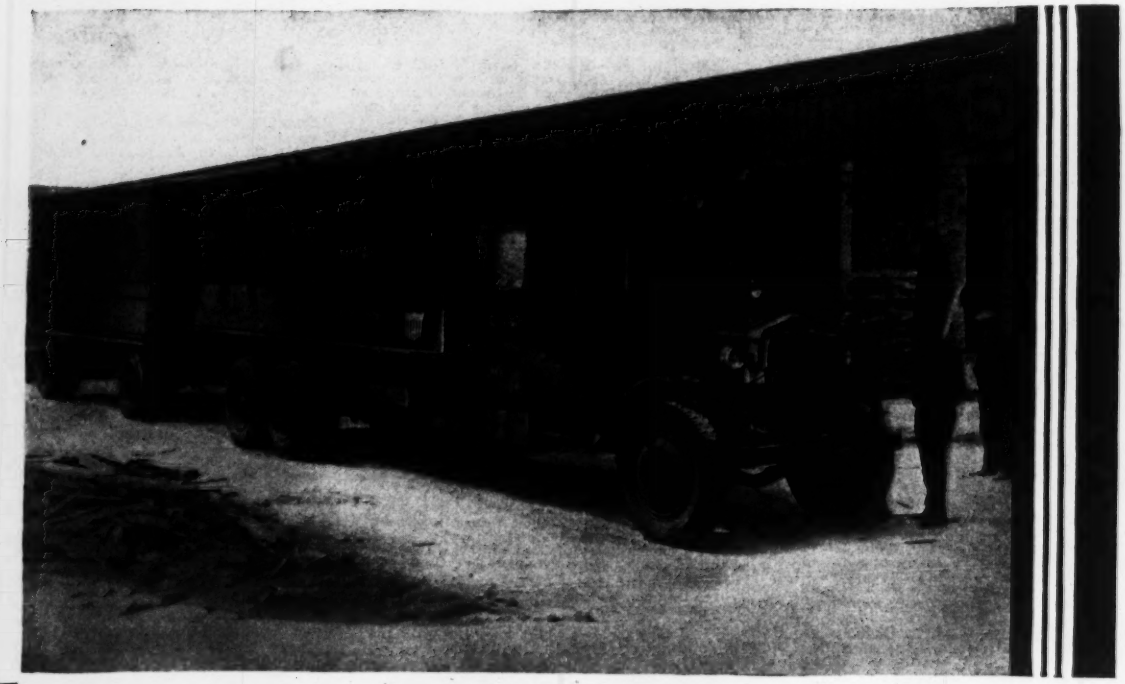
Calif., Santa Ana—State Hy. Comn., Sacramento, surveys widening Santa Ana Bridge, Riverside Co. $150,000. C. H. Purcell, P. Wks. Bldg., Sacramento, engr.

Ill., North Aurora—Aurora Twp. made application through J. S. Schwartz, hy. comr., for approval of plans bridge across Fox River at State St. replacing existing bridge.

Mass., Falmouth — Town, Bd. Selectmen, bridge and hy. improvements. $48,481 appropriated.

Mass., Mansfield — Town, Bd. Selectmen, bridge and hy. improvements. $30,000 appropriated.

Const. News page 960



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Bridges (Continued)

Mass., Oak Bluffs — Town, Bd. Selectmen, improving bridges, hys. $28,850 appropriated.

Mass., Shirley—Town, A. H. Jubb, hy. surv., rebuilding Phoenix Bridge, concrete. $25,000. Engineer not selected.

Mass., Tisbury — Town, Bd. Selectmen, improving bridges, hys. $34,800 appropriated.

Mo., St. Louis—Bd. P. Serv., City Hall, and Chicago, Burlington & Quincy R.R. Co., A. W. Newton, ch. engr., 547 West Jackson Blvd., Chicago, Ill., increasing span bridge over Riverview Dr. at Prospect Hill. $101,000. L. R. Bowen, ch. engr. bridges and buildings.

N. J., New Providence — Bd. Freeholders Union Co., Court House, Elizabeth, preliminary plans steel, concrete bridge over Passaic River, Passaic Ave. $25,000. R. Collins, Court House, Elizabeth, co. engr.

Okla., Kinta—State Hy. Dpt., Oklahoma City, preliminary plans 1 span 110 ft. bridge over Beaver Creek, Haskell Co. $40,000. A. R. Losh, hy. engr.

Okla., Stigler—State Hy. Dpt., Oklahoma City, preliminary plans 8 span 118 ft., rein.-con. bridge, Haskell Co. $32,000. A. R. Losh, hy. engr.

Pa., Plains (br. Wilkes-Barre)—Luzerne Co. (Wilkes-Barre) 2 or 3 span 1,000 ft. concrete, rein.-con. bridge. $25,000-$30,000. F. J. Wintermute, Road and Bridge Dpt., Wilkes-Barre, engr.

Pa., Wilkes Barre—Bids about April, 1 span 50 ft. concrete, rein.-con. bridge over Mill Creek. $25,000. W. John, city engr.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, withdrew bids to be opened Feb. 27, Special Bridge Project 18, incl. concrete, steel bridge between Dayton and Decatur, Rhea and Meigs Counties. R. H. Baker, hy. comr. Noted Feb. 12.

Tenn., Pocahontas — State Dpt. Hys. & P. Wks., Nashville, replacing present bridge with new bridge over Hatchie River, near here.

Texas—G. Gilchrist, state hy. engr., Austin, withdrew bids to be opened Feb. 27, for San Marcos River Relief and Seals Creek Bridges, on Hy. 3-A, Federal Aid Project 79 (reopened), Caldwell Co. $56,000. Will readvertise probably in March. Noted Feb. 16.

Texas — Comanche Co. (Comanche) and Federal Aid, soon take competitive bids 1,020 ft. rein.-con. bridge, 24 ft. over Leon River, Hy. 10, Federal Aid Project 580-A, Comanche Co. $90,000.

Ont., Toronto—For 300 ft. concrete hy. and pedestrian bridge on St. Edmund's Dr., incl. concrete abutments, piers, spans and railings. $63,850. R. C. Harris, City Hall, engr.

Que., Joliette — Provincial Dpt. P. Wks., Parliament Bldgs., Quebec, two 70 ft. and two 40 ft. concrete, slab arch bridge. $65,000. O. Desjardins, Parliament Bldgs., Quebec, engr.

Que., Lotbiniere—Municipal Council, E. Auger, secy., 70 ft. rein.-con. arch bridge, 28 ft. $30,000.

Que., St. Pierre de Veronne — Municipal Council, rein.-con. arch bridge. $60,000. N. Bilodeau, Pike River, secy.

BIDS ASKED

California — Mar. 18, by State Hy. Comn., Sacramento, bridge, incl. five 35 ft. steel springer spans with concrete deck on concrete pile bents over Lytle Creek 2 mi. west of San Bernardino, San Bernardino Co. C. H. Purcell, hy. engr.

Conn., Hamden—Mar. 6, at office Selectmen, Town Hall, one 60 ft. span, rein.-con. bridge, approaches over Mill River, Skiff St.

Ill., Rockford—See "Streets and Roads."

Louisiana—Mar. 17, by State Hy. Comn., Baton Rouge, bridge over Black River at Jonesville, in Catahoula and Concordia Parishes; bridge over Industrial Canal on New Orleans-Chef Menteur Hy., Orleans Parish. H. B. Henderlite, hy. engr.

Mississippi—See "Streets and Roads."

N. Y., Long Island City—Mar. 9, by G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., bridge, approaches to carry Sunrise Hy. over Rockaway Blvd. Noted Feb. 19.

North Carolina—Mar. 10, by State Hy. Comn., Raleigh (**P. means Project**), rein.-con. bridges, culverts on P. 7961, $33,000 — P. 7960, $175,000 — P. 796, $61,000, all foregoing in Yadkin Co.—P. 1643, Nash Co., $34,600. J. D. Waldrop, Raleigh, engr.

O., Cleveland—Mar. 6, by City 2 foot bridges, 150 ft. steel, concrete for approaches to Lakefront stadium, $100,000. Wilbur Watson & Associates, 4614 Prospect Ave., engrs.

Pa., Phila. — Mar. 11, by Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., bridge over University Ave. under Pennsylvania R.R. and Philadelphia, Baltimore and Washington R.R.

Pa., Pittsburgh—Mar. 10, by R. G. Woodside, controller Allegheny Co., concrete culvert under Pennsylvania R.R. (part of new West End-North Side Bridge), also wing walls, filling approaches from Stueben to Main Sts., incl. 4,500 cu.yd. excav., 3,100 cu.yd. concrete, 184,000 lb. reinforcing steel, 50,000 lb. structural steel, sheet piling left in place. $120,000. V. R. Covell, 519 Smithfield St., engr.

Tex., Houston—Mar. 16, by Harris Co., c/o H. L. Washburn, aud., rein.-con. bridge over Buffalo Bayou on Post Oak Rd. $25,000. C. R. Haile, Houston, co. engr. Noted Feb. 19.

Vermont—Mar. 6, by Hy. Dpt., Montpelier, 25 ft. concrete T-beam bridge, gravel approaches, Westford; 40 ft. T-beam bridge, gravel approaches, Stowe.

Washington—Mar. 10, at office S. J. Humes, dir. Hys., Olympia, concrete paving 3.3 mi. State Rd. 2, Redmond East, F. A. P. 181-A, King Co.—grading, draining 1.2 mi. State Rd. 9, East City Limits of Aberdeen West, Grays Harbor Co.—constructing 4 bridges over Twisp and Methow Rivers, on Methow Valley Hy., Okanogan Co.

Wis., Kaukauna — Mar. 12, by State Hy. Comn., and Outagamie Co. Hy. Com., Nicolet Bldg., Green Bay, constructing Lawe Street Bridge, approaches, S.T.H. 55, S.A.P. 3322.

Wisconsin—Mar. 10, by State Hy. Comn. and Sauk Co. Hy. Com., Capitol Annex, Madison, Beth Bridge on S.T.H. 154, S.A.P. 1370 — Narrow Creek Bridge, on S.T.H. 33, S.A.P. 1369 —Giblin Bridge, S.T.H. 33, F.A.P. 448-B-Sect. 2.

CONTRACTS AWARDED

Arkansas—State Hy. Dpt., Little Rock, 9 treated timber and pile trestle bridges, in Drew Co., to Prentice & Prentice, Little Rock, $25,232 ets. $31,700—280 ft. deck girder bridge on concrete piers, abutments, Searcy Co., to M. H. Franks Constr. Co., Marshall, $29,755 est. $36,700—9 treated timber steel truss and I-beam bridges, concrete piers, Logan and Franklin Counties, to McEachin & McEachin, Home Insurance Bldg., Little Rock, $59,470 est. $66,500 —461 ft. steel truss and deck girder bridge, concrete piers, abutments, Johnson Co., and 344 ft. steel truss and deck girder bridge, concrete piers, abutments, Boone Co., to F. Luttjohann, Topeka, Kan., $24,336 and $37,892 respectively est. $28,100 and $41,800 respectively. Grand total $176,685.

Georgia—State Hy. Dpt., J. W. Barnett, hy. engr., East Point, bridges, Hancock and Warren Counties, to Austin Bros. Bridge Co., 1195 Mickleberry St. S. W., Atlanta, $21,821—Oconee and Morgan Counties, to Wanamaker Wells, Inc., Orangeburg, S. C., $33,688—Tift Co., to D. B. Scott, 229 Ponce de Leon Pl., Decatur, $62,040 —2 bridges, Morgan Co., to Nichols Constr. Co., 1281 La France St., Atlanta, $36,396. Grand total $153,945. Noted Feb. 12.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, bridges in Pike Co., to C. Logsdon, Beardstown, $6,589—Union Co., to Watt Constr. Co., Winchester, $21,829—Route 85, Sect. 103-B Mercer Co., to P. McGlone, Harrisonville, Mo., $9,268—Route 85, Sect. 104-B Mercer Co., to A. P. Munsen, Marion, Ia., $42,968—Route 85, Sect. 103-C and Route 85, Sect. 104-C Mercer Co., to Continental Bridge Co., 460 Monadnock Bldg., Chicago, $6,420 and $4,716 respectively. Grand total $81,610. Noted Jan. 22.

Ill., Chicago — J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., superstructure South Harlem Avenue Bridge, to Ketler-Elliott Co., 3101 South California Ave., $517,680. Noted Jan. 15.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, steel, concrete bridge over Baltimore & Ohio R.R. at Frederick Junction, incl. all necessary earth approaches, surfacing, etc., Contr. F-158-53, Frederick Co., to F. Carozza & Son, 2444 North Charles St., Baltimore, $39,409. Noted Jan. 8.

Md., Baltimore—Bd. Awards, 585 ft. steel, concrete bridge, incl. four 60 ft. steel deck plate girder spans, 20 ft. rein.-con. roadway, pipe railing over Gunpowder Falls at Prettyboy Dam, to Forbes-Murphy Contg. Co., 326 St. Paul St., $103,241. Noted Feb. 5.

Michigan—J. T. Sharpensteen, div. bridge engr., Escanaba, FB 1 of 36-5-12, C-2, 2 rein.-con. abutments, steel deck girder bridge, Iron Co., for State Hy. Comn., Lansing, to Bethlehem Steel Co., Bethlehem, Pa., $3,951; C-3, to S. Mills, Escanada, $31,511. Noted Jan. 29.

New Jersey — State Hy. Comn., Trenton, 2 bridges in Bergen Co., to Brooks Bros., Inc., 5 James St., Paterson, $84,160. Noted Feb. 5.

N. J., Atlantic City—Bd. City Comrs., City Hall, repairing, altering Absecon Blvd. Bridge over Venice Lagoon, to Atlantic Constr. Co., Missouri and Atlantic Aves. Est. $25,000. Noted Feb. 16 Daily.

New York—A. W. Brandt, comr. Hys., Albany, bridges in Schoharie Co., to D. B. Riggs, Troy, $21,027 est. $30,938—Chautauqua and Erie Counties, to Eden Lumber & Supply Co., Inc., Eden, $18,699 and $11,890 respectively, est. $23,435 and $15,733 respectively—Madison Co., to T. Venezia, Syracuse, $5,105 est. $6,437 —Delaware Co., to F. Lewis & Sons, Inc., Bainbridge, $76,809 est. $95,579—Montgomery Co., to Albany Bridge Constr. Co., Inc., 518 Bway., Albany, $54,738 est. $75,377—Oneida Co., to F. A. Ray, Herkimer, $18,621 est. $25,485 — Hamilton Co., to Spooner Bridge Constr. Co., 488 Bway., Albany, $40,821 est. $55,299 — Oneida Co., to M. A. McCoy, Inc., Utica, $51,194 est. $74,683 — Steuben Co., to Peckham Constr. Co., Inc., Crosby Bldg., Buffalo, $67,213 est. $92,356—2 bridges in Monroe Co., to M. E. Colle, Inc., LeRoy, $22,840 est. $28,959. Grand total $388,957. Noted Jan. 29.

N. Y., Buffalo—W. G. Hickman, comr. Erie Co., 20 County Hall, 24 x 30 ft. I-beam bridge on North Millgrove Rd., C.R. 268, Alden, to Queens Constr. Co., Harlem Rd. and Clinton Forks, $7,884—20 x 24 ft. concrete slab bridge on Pratham Rd., C.R. 407, Sardinia, to North Fillmore Concrete Co., 119 Harriett St., $6,600 —twinspan concrete arch bridge on Lein Rd., C.R. 154, over Buffalo Creek, West Seneca, to Cefali-Hall Constr. Co., South Wales, $22,827. Grand total $37,111. Noted Feb. 5.

Pennsylvania—See "Streets and Roads."

R. I., Providence—Bd. Contr. & Supply, concrete bridge, Eagle and Quinsley Sts., to New England Concrete Co., 75 Westminster St., $21,349. Est. $25,000. Noted Jan. 22.

Tex., Austin—City, c/o A. Johnson, mgr., 100 ft. rein.-con. bridge over Shoal Creek, 5th St. to J. F. Johnson, 509 East 3rd St., $22,595. Est. $35,000.

Tex., Austin—City, c/o A. Johnson, mgr., 3 rein.-con. bridges, 2 over Waller Creek and 1 over Blum Creek, to J. R. Blackmore, 1501 West 9th St., $20,388. Est. $26,000. Noted Feb. 12.

Tex., Houston — Harris Co., c/o H. L. Washburn, aud., 165 ft. span rein.-con. bridge, 30 ft. roadway, 6 ft. sidewalks over Brays Bayou, Main St. Loop, to J. F. Buckner, 407 North Main St., Cleburne, $20,227. Est. $26,000. Noted Feb. 5.

STREETS AND ROADS

BIDS ASKED

California—Mar. 18, by C. H. Purcell, engr., State Hy. Comn., Sacramento, grading 5.5 mi. road mixed bituminous crushed gravel or stone surfacing 13.5 mi. Pepperwood School-Little Dam Creek Rd., Mendocino Co.; 35 ft. steel stringer span bridge, concrete deck, steel pile bents over Litye Creek, near San Bernardino, San Bernardino Co.

Calif., Anaheim—Mar. 10, by City Council, E. B. Merritt, clk., grading, 4 in. asphaltic concrete paving 85,000 sq.ft. North East St.

Calif., Palo Alto—E. L. Beach, city clk., bids about Mar. 9, grading, curbing, sidewalks, 6 in. concrete paving 308,520 sq.ft. Hale St. Palo Alto Ave., et al. Former bids returned unopened. Noted Feb. 26.

Calif., San Jose—Mar. 16, by H. Pulster, clk., Santa Clara Co., oil macadam surfacing 50,275 sq.ft. Cadwallor Ave.—516,000 sq.ft. Congress Springs Rd.—218,750 sq.ft. San Jose-Almaden Rd. R. Chandler, San Jose, co. surv.

Colorado—Mar. 11, by State Hy. Dpt., Denver, grading, drainage structures, gravel surfacing 9.883 mi. Mack-Colorado-Utah line Rd., Federal Aid Project 242-D, Mesa Co.; 5.076 mi. State Hy. 4 west of Stratton, Federal Aid Project 134-D, Div. 1, Kit Carson Co. C. D. Vail, hy. engr.

D. C., Wash—Mar. 16, by District Comrs., District Bldg., 35,400 lin.ft. concrete curb, 8,500 sq.yd. concrete gutter (or shoulder and laying 80,000 sq.yd. asphaltic surface or alternate—grading, curbing, concrete or alternate type paving 80,000 sq.yd.—resurfacing 60,000 sq.yd. asphaltic, concrete or granite block streets and avenues by replacement method with sheet asphalt on concrete base or alternate; adv. E.N.-R. Mar. 5.

D. C., Wash.—Mar. 18, by District Comrs., District Bldg., widening, paving, repaving 42,000 sq.yd. various streets and avenues with standard asphalt pavement or alternate and improving Blaudensburg Rd. N.E. with 25,000 sq.yd. standard asphalt paving and 56,000 sq.yd. asphaltic surface or alternate; adv. E.N.-R. Mar. 5.

Idaho—Mar. 10, by A. Harbour, comr. P. Wks., Boise, grading 0.794 mi. North and South Hy., at Driftwood Point, Kootenai Co.; crushed gravel surfacing 2.558 mi. Old Oregon Trail between Glenn's Ferry and Hammett, Elmore Co.

Ind., Terre Haute—Mar. 12, by Bd. Comrs. Vigo Co., gravel surfacing 2.18 mi. Leake Rd., $16,332—0.5 mi. Shattuck Rd., $2,406—vitr. brick surfacing Hyland Rd., $9,748. T. O. Garrigus, Terre Haute, engr.

Ind., Terre Haute—Mar. 20, by Bd. Comrs. Vigo Co., pre-coated bituminous macadam surfacing 4,721 ft. Raymond B. Kintz Rd. $70,709. C. C. Pinson, Terre Haute, aud.

Ia., Indianola—Mar. 13, at office Auditor Warren Co., grading 4.048 mi. road from U. S. Hy. 65 at Scoteh Ridge to Carlisle; 5.06 mi. Primary Rd. 2 near Martensdale toward St. Marys.

Ia., Mt. Pleasant—Mar. 10, at office Auditor Henry Co., grading 9.056 mi. U. S. Hy. 161 to Des Moines Co. line. C. E. Smith, Mt. Pleasant, co. engr.

Ia., Sioux City—Mar. 27, by City Council, 5 in. concrete paving 4,500 sq.yd. various alleys, 17,580 sq.yd. 3rd Ave., Hamilton, South Leonard 8th, South Cecelia, 30th and 34th Sts. $49,787.

Kansas—Mar. 9, by State Hy. Comn., Court House, Stockton. (**P. means Project and F.A.P., Federal Aid Project**) grading culverts 7.444 mi. P. 1-15, F. A. P. 286-C, Ellis Co., incl. four 8 ft. multiple box spans, and fifteen 40 ft. deck girder spans—4.448 mi. P. 40-N-11, F. A. P. 379-B, Graham Co., incl. eight 30 ft. deck girder spans, eleven 8 ft. multiple box spans—17.257 mi. P. 40-N-12, F. A. P. 379-C incl. five 10 ft., five 9 ft., two 10 ft., and four 8 ft. multiple box spans, nine 30 ft. and three 40 ft. deck girder spans—clay gravel surfacing 5.237 mi. P. 40-N-13, F. A. P. 371-F—1.307 mi. P. 40-N-13, Kansas Project 1147, all foregoing Rooks Co.—8.62 mi. P. 40-N-14

Const. News page 91

Streets and Roads (Continued)

F. A. P. 371-D Osborne Co. — oil and sand gravel on chats surfacing 6.818 mi. P. 1.14. F. A. P. 269-B, Ellis Co. W. V. Buck, Topeka, hy. engr.

Kansas—Mar. 11, by State Hy. Comn., Court House, Saline (P. means Project and F.A.P., Federal Aid Project) grading, culverts 3.011 mi. P. 15-16, F. A. P. 370-B, incl. three 8 ft. multiple box spans, three 35 ft. deck girder spans—concrete surfacing 0.225 mi. P. 40-S 19, F. A. P. 108-A, incl. four 8 ft. multiple box spans, both Dickinson Co.—4.427 mi. P-77-10, F. A. P. 240-C, Marion Co.—concrete paving—0.86 mi. P. 40-S-20, F. A. P. 10-AB, incl. six 10 ft. multiple box spans—0.364 mi. P. 40-S-22, F. A. P. 12-A, both Geary Co.—0.38 mi. P. 40-S-15-B, F. A. P. 374-C, Ellsworth Co.—9.753 mi. P. 40-S-16, F. A. P. 374-B, incl. six 8 ft. multiple box spans — 9.753 mi. P. 40-S-16, F. A. P. 374-B, Saline Co.—2.031 mi. P. 81-12, F. A. P. 287-A—2.981 mi. P. 81-12, F. A. P. 287-B, both McPherson Co. W. V. Buck, Topeka, hy. engr.

Kansas—Mar. 13, by State Hy. Comn., Court House, Oskaloosa **(P. means Project and F.A.P. Federal Aid Project)** grading, culverts 3.907 mi. P. 9.27, F. A. P. 320-B Jackson Co.—5.711 mi. P. 50-N-29, F. A. P. 419-F Lyon Co., incl. four 30 ft. deck girder spans, one 80 ft. steel truss span, three 40 ft. deck girder spans, two 10 ft., three 8 ft. multiple box spans—4.385 mi. P. 11-23, F. A. P. 432-A Pottawatomie Co., incl. two 12 ft. and three 8 ft. multiple box spans, one 90 ft. steel truss span, nine 30 ft. deck girder spans—6.596 mi. P. 77-23, F. A. P. 409-B Riley Co., incl. six 30 ft. deck girder spans, one 80 ft. steel truss span—sand gravel or chats surfacing 0.398 mi. P. 50-N-28, F. A. P. 419-D—oil and sand gravel or chats surfacing 3.722 mi. P. 50-N-28, F. A. P. 419-E, both Lyon Co.—sand gravel or chats surfacing 1.25 mi. P. 11-28, Kansas Project 1095—3.5 mi. P. 9-20, Kansas Project 1149, both Marshall Co.—re-gravel surfacing 6 mi. P. 33-5, Kansas Project 7269 Johnson Co.—grading, concrete surfacing 0.093 mi. P. 10-11, F. A. P. 175-B—0.603 mi. P. 10-11, F. A. P. 133-A—grading, culverts, concrete paving 5.983 mi. P-10-11, F. A. P. 227-C, incl. 25 ft. extension to deck girder span, three 30 ft. deck girder spans, two 10 ft. multiple box spans, all Jefferson Co. W. V. Buck, Topeka, hy. engr.

Kansas—Mar. 20 (extended date), by State Hy. Comn., Court House, Winfield, **(P. means Project and F.A.P., Federal Aid Project)** concrete surfacing P-77-4, F. A. P. 230-B—3.647 mi. P. 77-3 and 4, F. A. P. 230-A—3.879 mi. P. 77-3, F. A. P. 230-F—0.134 mi. P-77-3 and F. A. P. 230-D, all Cowley Co. W. V. Buck, Topeka, hy. engr.

Kan., Westmoreland — See "Contracts Awarded."

Louisiana — Mar. 17, by State Hy. Comn., Baton Rouge, concrete surfacing 9.7 mi. Logtown-Corey Hy., Caldwell and Ouachita Parishes—5 mi. Many Rd., Sabine Parish—surface treating 17 mi. from Ringgold to intersection with Route 10, Bienville Parish—24.4 mi. Simpson-Zimmerman Hy., Vernon and Rapides Parishes—amiesite surfacing 18 mi. Azucema-St. Joseph Hy., Tensas Parish. H. B. Henderlite, hy. comr.

Maryland—Mar. 10, by State Hy. Dpt., Baltimore, G. C. Uhl, ch., graveling 1.75 mi. Contr. P-52-34, Prince George's Co.—concrete paving 1 mi. Contr. Q-66-24, Queen Anne's Co.—1 mi. Contr. Wo-98-14, Worcester Co. L. H. Steuart, secy.; adv. E. N.-R. Mar. 5.

Md., Baltimore—Mar. 11, by Bd. Awards, concrete paving 10,200 sq.yd. streets listed in Contr. 586; sheet asphalt paving 10,800 sq.yd. streets listed in Contr. 587. N. L. Smith, Municipal Bldg., hys. engr.

Mass., Harwich—See "Contracts Awarded."

Mass., Hudson—See "Contracts Awarded."

Mass., Marblehead—See "Contracts Awarded."

Mass., Newport—Taking bids rein.-con. paving 18,000 yd. West Broadway and Spring St. $35,000. J. A. Openshaw, City Hall, Comr. P. Wks.

Mass., Taunton—See "Contracts Awarded."

Mass., Wakefield—See "Contracts Awarded."

Mass., Winchester—Mar. 12, by Metropolitan Dist. Comn., 20 Somerset St., Boston, resurfacing South Border Rd., incl. 5,000 cu.yd. earth excav., 2,000 cu.yd. ledge excav., 5,000 cu.yd. gravel borrow, 3,500 tons broken stone, 26,000 gal. bitulithic material.

Michigan—Mar. 10, by R. W. Roberts, resident engr., Saginaw, shaping, concrete paving 3.377 mi. FO18-4C, Clare Co., for State Hy. Comn., Lansing.

Michigan—Mar. 11, by A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage structures, concrete paving 2.128 mi. Fo24-20C-3, Emmet Co., 20 ft., for State Hy. Comn., Lansing.

Minn., Duluth—St. Louis Co., bids in April, paving Hermantown, Gulbranson and Becks Rds. $235,000. S. G. Shepard, co. engr.

Mississippi — Mar. 13, by State Hy. Comn., Jackson **(F.A.P. means Federal Aid Project)** grading, drainage structures, concrete, sheet asphalt, rock asphalt, asphaltic concrete on concrete or gravel surfacing 3.508 mi. Corinth-Jackson Tennessee Rd., F. A. P. 178-Reopened, Alcorn Co.—clearing, grubbing, grading, drainage structures, bridges 6.156 mi. Jackson-Florence Rd., F. A. P. 200-B, Rankin Co., incl. 3.51 mi. Bermuda sodding, 71,441 lb. reinforcing — 6.674 mi. Hattiesburg-Ellisville Rd., F. A. P. 70-D, Forrest Co., Incl. 3.7 mi. Bermuda sodding 52,409 lb. reinforcing, 176,300 ft. b.m. creosoted lumber, 5,220 lin.ft. creosoted piling — 13.046 mi. Tutwiler-Clarksdale Rd., F. A. P. 212-A, Coahoma Co., incl. 10.66 mi. Bermuda sodding, $108,339 lb. reinforcing — 10.282 mi. Hattiesburg-Gulfport Rd., F. A. P. 73-D, Forrest Co., incl. 4.64 mi. Bermuda sodding, 76,299 lb. reinforcing, 22,000 lb. structural steel, 147,380 ft. b.m. creosoted lumber, 7,161 lin.ft. creosoted piling—5.559 mi. Collins-Mount Olive Rd., F. A. P. 200-C, Covington Co., incl. 2.63 mi. Bermuda sodding, 112,578 lb. reinforcing—2.045 mi. Jackson-Crystal Springs Rd., Hinds and Copiah Counties, incl. 1.2 mi. Bermuda sodding, 12,840 lb. reinforcing steel. C. M. Williams, dir.

New Jersey—Mar. 16, by State Hy. Comn., Trenton, concrete and 9 in. rein.-con. paving 0.147 mi. Route 22, Sect. 1 North to South Ave., Cranford, Union Co.; 7 in. penetration macadam paving and 9 and 18 in. rein.-con. paving 2.222 mi. Route 29, Sects. 1A and 2A; Long Ave. to Union County Parkway, Union Co. A. L. Grover, ch. clk.; adv. E. N.-R. Mar. 5.

N. J., Long Branch—Mar. 10, by Bd. City Comrs., H. N. West, clk., City Hall, reconstructing North Lincoln Ave. from Norwood to Ocean Aves. O. R. Seaman, city engr.; adv. E.N.-R. Mar. 5.

New York and New Jersey—Mar. 23, at office General Manager Port of New York Authority, 80-90 8th Ave., New York, paving, railings, miscellaneous construction for Kill van Kull Bridge between Bayonne, N. J. and Port Richmond, N. Y. J. F. Galvin, chn.; adv. E. N.-R. Mar. 5.

New York—Mar. 16, at office Taconic State Park Comn., J. W. Bradner, Jr., ch. engr., 25 Market St., Poughkeepsie, grading, drainage and structures on 3.8 mi. Sect. 1, Part 1, Eastern State Parkway from Westchester-Putnam Co. line to New Hill Rd., Putnam Co.; adv. E. N.-R. Mar. 5.

New York—Mar. 25, by A. W. Brandt, comr. Hys., Albany, constructing hys. in Allegany Chenango, Essex, Madison, Nassau, Oneida, Lewis and Oswego Counties; reconstructing hys. in Dutchess, Monroe, Livingston, Orange, Oswego, and Tompkins Counties; adv. E.N.-R. Mar. 5.

N. Y., Buffalo—Mar. 12, by G. Fisk, comr. P. Wks., Municipal Bldg., repaving street railway area in Hamburg St.—paving new street south of City Hall from Genesee to South Elmwood Aves. and from Niagara St. to South Elmwood Ave., Zittle, Bush Sts.—repaving Longnecker and Sherman Sts. W. Rathman, city engr.

N. Y., Long Island City—Mar. 9, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading, retaining walls, bridges for cemetery roads, in Interborough Parkway from Cypress Hills to Forest Park.

N. Y., New York—Mar. 11, by W. J. Flynn, acting pres. Bronx Boro, grading, curbing, sidewalks, sheet asphalt on concrete paving Marcy Pl., Astor, Morrison, Stratford and Fetley Aves.

N. Y., New York—Mar. 12, by S. Levy, pres. Manhattan Boro, Municipal Bldg., laying, relaying sidewalks, curbs when and where directed during 1931, granite block on concrete repaving North William St. from Park Row to William St.

North Carolina—Mar. 10, by State Hy. Comn., Raleigh, **(P. means Project)**, grading, drainage structures, concrete or asphaltic paving 6.55 mi. P. 6070 Anson Co., $141,200—7.06 mi. P. 6694 Rowan Co., $133,931—9.94 mi. P. 9081, Buncombe Co., $127,000—clearing, grubbing, grading, drainage structure, 5.44 mi. P. 9811, $33,-700—3.89 mi. P. 9812, both Swain Co.—grading, drainage structure, topsoiling 7.99 mi. P. 796, Yadkin Co., $95,800. J. D. Waldrop, Raleigh, engr.

North Carolina—Mar. 10, by State Hy. Comn. **(P. means Project)**, grading, drainage structures, concrete or asphalt paving 7.94 mi. P. 8451, McDowell Co., $153,200—10.47 mi. P. 1751, Pasquotank Co., $213,200—13.25 mi. P. 2560, Lenoir Co., $65,300—9.44 mi. P. 3201, Brunswick Co., $141,000—15.08 mi. P. 3670, Onslow Co., $125,500—9.66 mi. P. 4364, Harnett Co., $197,400—6.07 mi. P. 4460, Lee Co., $137,-600—3.31 mi. P. 5070, Alamance Co., $66,500—7.65 mi. P. 5551, Montgomery and Randolph Counties, $139,400 — grading, drainage structures, topsoiling 5.46 mi. P. 3851, Robesoh Co., $44,100—15.62 mi. P. 7961, Yadkin Co., $139,-000. J. D. Waldrop, Raleigh, engr.

O., East Liverpool—Bd. Control, bids about Apr. 19, widening from 20 to 36 ft., repaving 2 mi. Pennsylvania Ave. $114,000-$155,000. L. C. Kirk, Lisbon, engr.

Oregon—State Hy. Comn., Salem, bids about July 1, improving 90 mi. Yellowstone Cutoff, Malhuer and Lake Counties, 18 ft. $374,000. R. Klein, state hy. engr.

Pa., Phila. — Mar. 17, by Bureau of Hys., Dpt. P. Wks., City Hall Annex, Schedule B, curbing and footway work (city to pay) 1st, 2nd and 3rd Hy. Dists. A. Murdoch, dir. P. Wks.

Pa., Williamsport—Mar. 10, by City Council, curbing, manholes, sewer connections, vitr. brick on concrete paving 11,028 sq.yd. Wayne, 5th and Park Aves., Court, DuBois and Laurel Aves. $35,000. L. Mussina, Williamsport, engr.

Rhode Island — Mar. 11, by State Bd. P. Roads, Providence, **(E.F.A.P. means Emergency Federal Aid Project)**, bituminous macadam-penetration paving 3.6 mi. Sakonnet Point Rd. from Burchard's Corner southerly to Sakonnet Point, Little Compton, E. F. A. P. 72-A, Contr. 3101—5.2 mi. Westerly Shore Rd. from Watch Hill Rd., to Haversham's Corner on Post Rd., Westerly, E. F. A. P. 73-A, Contr. 3108—concrete paving 1.6 mi. Occupasstuxet Rd. from Hoxsie Corner on Warwick Ave. westerly to Elmwood Ave., Warwick, E. F. A. P. 74, Contr. 3107; adv. E. N.-R. Mar. 5.

Tex., Dallas—City taking bids brick paving 35,000 yd., concrete paving 16,000 yd. and asphalt paving 28,000 yd. following streets: Canton St. from Marion to De Soto Sts.—East Side St. from Exposition to Hill Sts.—Oakland St. from Grand St. to Park Row—Harwood St. from Forest to Cooper Sts.—Mont Clair St. from Jimtown to Lebanon Sts.—Martinique St. from Gurley to Santa Fe Sts.—Colorado St. from Fleming to Jefferson Sts.—Colorado St. from Jefferson to Lancaster Sts.—Crowdus St. from Elm St., to Texas & Pacific R.R.—Alaska St. from Woodin to Edgemont Sts.—Michigan St. from Woodin to Edgemont Sts.—Clark St. from Cochran to Thomas Sts.—Cochran St. from Routh to Ball Sts.—Julius St. from 2nd to Exposition Sts.—Juliette St. from Allen St. to point 200 ft. east of Houston and Texas Central R.R.—Jeffries St. from Eakin St. to point 500 ft. north of Dawson St.—Jeffries St. from point 500 ft. north of Dawson St. to Gulf, Colorado & Santa Fe R.R.—Burger St. from Oakland to Myrtle Sts.—Burger St. from Oakland to Jeffries Sts.—Hendricks St. from Woodbine to Waco Sts.—Longview St. from Homer to point 167 ft. east of Grandview St.—Rockwood St. from Foster to Pembroke Sts.—Watkins St. from Flora to Cochran Sts.—Mont Clair St. from King's Hy. to point 193 ft. north—Ross St. from Lamar to Austin Sts.—Austin St. from Ross to Pacific Sts. $300,000. Municipality's part of cost will be about $50,000.

Tex., Galveston—Mar. 12, by City, c/o F. A. Quin, aud., concrete curbing, concrete bulkheads, 30 in. drains, 1 in. wearing surface or 5 in. monolithic concrete on 4 in. concrete paving 28,500 sq.yd.

Tex., Spearman—Mar. 10, by City, c/o W. D. Cooke, mayor, curbing, guttering, grading, rein.-con., brick or asphalt paving 28,384 sq.yd. Montgomery & Ward, Snider Bldg., Wichita Falls, engrs.

Washington—Mar. 17, by S. J. Humes, dir. Hys., Olympia, concrete paving 2.2 mi. S.R. 1, Dakota Creek to Blaine, Emergency F.A.P. 137-C, Whatcom Co.—2.2 mi. State Rd. L, Rice's Auto Park to Yate's Corner, Emergency F.A.P. 107-B, Lewis Co.—10.9 mi. S.R. 3, Spokane Co. line to Thornton, Emergency F.A.P. 135-G, Whitman Co.—4 mi. State Rd. 5, Parkland to Roy Junction Rd., Emergency F.A.P. 159-B, Pierce Co.—grading, bridges on 13.5 mi. S.R. 4, Cache Creek N., Emergency F.A.P. 177-A, Ferry Co.

Wash., Seattle—Mar. 16, by Comrs. King Co., concrete paving 1.09 mi. 35th Ave. N. E.—1.25 mi. East 95th St.—1.4 mi. East Section Orillia Bend—1 mi. West 85th St. T. D. Hunt, Seattle, co. engr.

Wash., Seattle—Bd. P. Wks., bids about Apr. 13, extending, concrete sidewalks, mains, sewers in Empire Way. $146,000. R. H. Thomson, city engr.

CONTRACTS AWARDED

Arizona — State Hy. Comn., Phoenix, oil processing 19.8 mi. Tucson-Benson Hy., Pima Co., to Southwest Paving Co., 801 Washington Bldg., Los Angeles, Calif., $117,313.

Arizona — State Hy. Comn., Phoenix, oil processing 11.6 mi. Graham Co. and 7.8 mi. Graham Co., to Skeels & Graham, Consolidated Bank Bldg., Tucson, $53,511 and $43,902 respectively — grading, draining, placing subgrade stabilizer on 7.6 mi. Cochise Co., to Packard & Tanner, Phoenix, $152,667. Grand total $250,082.

Arizona—State Hy. Comn., Phoenix, grading, draining 4.5 mi. Mohave Co., to Martter & Bock, 1007 South Harvard Blvd., Los Angeles, Calif., $75,965. Noted Feb. 16 Daily.

Arkansas—State Hy. Dpt., Little Rock, grading, drainage structures 5.5 mi. roads in Lawrence Co., to W. W. Keaton, Clarendon, $21,170 est. $30,000—grading, drainage, structures, gravel surfacing 5 mi. Job 9123 and 6 mi. Job 9124, Searcy Co., to Jones, Spencer & Son Constr. Co., Hot Springs, $35,263 and $42,521 respectively est. $40,000 each, all foregoing 30 ft. wide—concrete surfacing 6.5 mi. Clark Co., 18 ft., to Grady Garms, 9th and Elm Sts., Little Rock, $42,810 est. $40,000—6 mi. Crawford Co., 30 ft., to Porter Constr. Co., Little Rock, $137,150 est. $140,000. Grand total $278,914.

California — State Hy. Comn., Sacramento, grading, oil treated crushed gravel or stone surfacing 29.3 mi. road on Barstow-Needles Lateral, San Bernardino Co., to H. W. Rohl Co., 4351 Alhambra Blvd., Los Angeles, $496,-246. Noted Feb. 19.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, waterworks, storm drains, culverts, 2 in. National on 6 in. concrete surfacing 175,000 sq.ft. Moorpark St., to G. R. Curtis Paving Co., 2440 East 26th St., Vernon, $82,-515. Noted Dec. 25.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, sidewalks, sanitary sewers, ornamental lighting system, concrete and asphaltic concrete paving Wilshire Blvd. between Grand Ave. and Figueroa St., to Southern

Const. News page 92

Streets and Roads (Continued)

California Roads Co., 530 West 7th St., $66,910.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, sidewalks, storm drains, sanitary sewers, concrete and asphaltic concrete paving 174,950 sq.ft. Manchester Ave. between Towne Ave. and St. Andrews Pl., to G. H. Oswald, 366 East 58th St., $260,795. Noted Jan. 29.

Calif., Santa Rosa — G. P. Sanborn, clk. Sonoma Co., grading, drainage structures, concrete surfacing road from Petaluma Rd. to Pt. Reyes Hy., to J. V. Galbraith, 314 7th St., Petaluma, $29,786. Noted Jan. 29.

Calif., Stockton — San Joaquin Co., grading, rock and asphaltic oil surfacing Farmington-Bellota Rd., to Periera & Reed, 545 Roosevelt Way, Tracy, $25,788.

Colorado—State Hy. Dpt., Denver, gravel surfacing, incl. bridge project. 7.863 mi. hy. in Adams and Arapahoe Counties, to C. B. Owen, Box 1984, Denver, $130,329; base course gravel surfacing 18.553 mi. Logan Co., to Bedford & Woodman, Inc., Julesburg, $237,782.

Florida—State Road Dpt., Tallahassee, clearing, grubbing, drainage structures, grading 11.16 mi. Road 28, F.A.P. 72-A, Putnam and Flagler Counties, and 11.79 mi. Rd. 28, F.A.P. 72-C, Flagler Co., to Murphy Constr. Co., Orlando, $84,260 and $119,478 respectively.

Florida — State Road Dpt., Tallahassee, broken stone base surfacing 14.91 mi. Rd. 28, Project 706-B, Putnam Co., to T. B. Gillespie, Inc., Palatka, $161,958.

Georgia—State Hy. Dpt., J. W. Barnett, hy. engr., East Point, to Whitley Constr. Co., La Grange, concrete paving 8.9 mi. Habersham Co., $208,905; 9.7 mi. Bullock Co., $232,962; 8.2 mi. Cobb Co., $158,019; 4.28 mi. Hart Co., $101,400—to Davis Constr. Co., Rhodes-Haverty Bldg., Atlanta, 5.085 mi. Hart Co., $142,925—to J. Monaghan, Pelham, sand clay surfacing 11 mi. Wayne and Long Counties, $21,630—to E. A. Hudson, Atlanta, grading, 1 bridge culvert, 9.5 mi. Madison Co., $76,016—to Newell Contg. Co., Martin Bldg., Birmingham, Ala., grading 6.563 mi. Gready Co., $35,777; 5.5 mi. Thomas Co., $34,900—to W. C. Shepherd, 347 Elizabeth St. N. E., Atlanta, 11.4 mi. Oconee and Morgan Counties, $56,360—to Beckham-Lawler Constr. Co., Perry, 7.6 mi. Morgan Co., $63,037—to Wesco Co., Volunteer Life Bldg., Chattanooga, Tenn., paving 8.352 mi. Seminole Co., $122,166; asphalt on bituminous concrete surfacing 11 mi. Decatur Co., $162,192. Grand total $1,416,289. Noted Feb. 12 and 19.

Idaho—Dpt. P. Wks., Boise, grading, crushed graveling 4.22 mi. Sawtooth Park Hy., Timmerman Hill Branch, Lincoln Co., to W. Hoopes, Twin Falls, $45,078. Noted Feb. 10.

Illinois — State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, grading roads in Jackson Co., to D. Smith, Benton, $6,891 — McDonough Co., to Swords-McDougall-Knapp, Peoria, $52,179—paving roads in Macon Co., to G. E. Hoffman Constr. Co., Lincoln, $219,563—Cook Co., to Arcole Constr. Co., Niles Center, $144,555—Bond Co., to Louis Rich Constr. Co., 2038 St. Clair Ave., East St. Louis, $132,404—Route 54, Sect. 544, DuPage and Will Counties, to John Mackler & Co., Chicago Heights, $148,979—Route 53, Sect. 534, DuPage and Will Counties, Route 66, Sect. 121, Will Co., to Powers Thompson Constr. Co., Joliet, $350,000—Route 78, Sect. 125, Henry Co., to McCarthy Impvt. Co., Kahl Bldg., Davenport, Ia., $127,768—Route 78, Sect. 126, Henry Co., to E. J. Eiff Co., Quincy, $152,694—Tazewell Co., to Jansen & Schaefer, Pekin, $75,947 — Henry Co., to Cameron Joyce & Co., Keokuk, Ia., $102,515. Grand total $1,513,485. Noted Jan. 22.

Ill., Chicago—Bd. Local Impvts., City Hall, grading, curbing, guttering, sewers, 5 in. granite block on 8 in. concrete paving North Peoria and Fulton Sts., to Peter J. O'Brien & Co., 4 North Cicero Ave., $72,394—clearing old paving, curbing, guttering, retaining walls, asphalt on present concrete paving West Roosevelt Rd., to J. M. Bransfield Co., 3525 South Leavitt St., $78,730—grading, curbing, guttering, sewers, asphalt on 8 in. concrete paving West 52nd, West 53rd and West 54th Sts., South Kolin, South Kostner, South Kenneth, and South Kolmar Ave., to R. F. Conway Co., 33 North La Salle St., $228,170—grading, curbing, guttering, 10 in. concrete paving South Damen Ave., to Hedges Constr. Co., 64 West Randolph St., $196,670—grading, curbing, guttering, sewers, asphalt on 6 in. concrete paving East 85th and 86th Sts., Merrill, Chappe land Clyde Aves. to American Asphalt Paving Co., 120 South La Salle St., $110,135. Grand total $686,099.

Ill., Lyons — Paving 2,450 sq.ft. and 4,200 sq.yd., to P. J. Crowley, Maywood, $30,609.

Ind., Ft. Wayne — Allen Co., concrete surfacing 15.03 mi. Monroeville Rd., to Brooks Constr. Co., 1123 Barthold St., $243,806. Est. $344,507. Noted Feb. 5.

Ind., Marion—City, improving 6 streets, day labor. $77,500.

Ind., Marion — Grant Co., rock asphalt on stone surfacing Johnson Rd., to R. L. Harris, Ft. Wayne, $45,269. Est. $54,000. Noted Jan. 29.

Ind., South Bend—Bd. Comrs. St. Joseph Co., gravel surfacing Silver and Tamarack Rds., to Mishler & Waller Constr. Co., New Paris, $11,052 and $10,324 respectively, est. $20,800 and $19,600 respectively—concrete surfacing 0.5 mi. Box Rd., to Bontrager Constr. Co., Ft. Wayne, $11,300 est. $15,200—0.8 mi. Grant Rd. and 0.38 mi. Edison Rd., to Reith-Riley Constr. Co., Goshen, $17,380 and $6,987 respectively, est. $23,400 and $10,600 respectively. Grand total $57,043. Noted Jan. 22.

Kan., Kansas City—Wyandotte Co., concrete paving Newton Rd. from state line to Muncie Bluff, to C. Brindle, 2400 Minnesota Ave., $32,027.

Kan., Westmoreland—Bd. Comrs. Pottawatomie Co., will grade, construct culverts 12 mi. Spring Creek Rd., 28 ft. roadway; and 12 mi. Blue Line Rd., own forces and machinery. L. F. Whearty, Court House, engr.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using 1st class rein.-con. pipe, traffic bound limestone surfacing 3.877 mi. approaches to Tyrone Bridge, S. P. 20-AGS., Anderson and Woodford Counties, to B. W. Gorham, Lexington, $58,627. Noted Dec. 11.

Kentucky—State Hy. Dpt., Oklahoma City, grading, drainage surfacing using, 1st class rein.-con. pipe 3.435 mi. Horse-Cave-Bear Wallow Rd., Hart Co., to E. A. Chilton & Co., London, $18,943; 5.455 mi. Hartford-Fordsville Rd., Ohio Co., to J. B. Westerfield, Owensboro, $55,956. Noted Nov. 13.

Louisiana — State Hy. Comn., Baton Rouge, concrete surfacing 11.4 mi. roads in Allen and Rapides Parishes, to James Stanton Constr. Co., Leavenworth, Kan., $256,235—16.5 mi. Assension and Assumption Parishes, to Sullivan, Long & Hagerty, Bessemer, Ala., $347,541—11.2 mi. Beauregard Parish, to Mills Eng. Constr. Co., Alexandria, $253,536. Grand total $857,312. Noted Dec. 18.

La., Lafayette—Grading, drainage structures, widening 56,000 sq.yd., to Southern Roads Co., Pioneer Bldg., Birmingham, Ala., $153,310.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., graveling 1.44 mi., Contr. Sm-79-82, St. Mary's Co., to Southern Maryland Contg. Co., 20 East Lexington St., Baltimore, $12,477. Noted Jan. 29.

Md., Baltimore—Bd. Awards, sheet asphalt paving 6,650 sq.yd. streets listed in Contr. 579, to P. Flanigan & Sons, Harford Rd. and Baltimore & Ohio R.R., $28,162; concrete paving 7,550 sq.yd. streets listed in Contr. 580, to Arundel Contg. Co., 910 Trinity St., $15,008. Noted Feb. 12.

Md., Baltimore—Bd. Awards, sheet asphalt paving 10,000 sq.yd. streets listed in Contr. 577, to Baltimore Asphalt & Block Co., 1320 North Monroe St., $30,281; concrete paving 11,100 sq.yd. streets listed in Contr. 578, to P. E. Rawlings, 2400 Aisquith St., $20,340. Noted Feb. 5.

Mass., Harwich—Town, Bd. Selectmen, reconstructing Sisson Rd., etc., day labor. $25,000.

Mass., Hudson—Bd. Selectmen, concrete sidewalks, granite curbing, concrete paving Manning St., etc., day labor. $25,000.

Mass., Marblehead — Town, Bd. Selectmen, sheet asphalt resurfacing Burber Rd., Atlantic Ave., separate contracts. $25,000.

Mass., Taunton—Asphalt, cement, stone paving, day labor. $150,000.

Mass., Wakefield—Town, Bd. Selectmen, W. Blanchard, chn., laying out and constructing number roads through Forest Glade Cemetery, separate contracts. $25,000 or more.

Minn., Waseca — Paving 23,350 sq.yd., to Anderson & Son, 100 North 7th St., Minneapolis, $54,728. Noted Jan. 22.

Mississippi — State Hy. Comn., Jackson, to Royce-Kershaw, Inc., Mobile, Ala., concrete surfacing 0.923 mi. Monroe Co. $63,845—to C. C. Guin, Guin, Ala., 1.321 mi. Grenada Co. $28,916—to Mobile Constr. Co., Mobile, Ala., 9 mi. Newton Co. $169,036—to Hartman-Clark Bros. Co., Peoria Life Bldg., Peoria, Ill., 8 mi. Scott Co. $171,761—to H. N. Donahoo, 510 North 21st St., Birmingham, Ala., grading, drainage structures 2.6 mi. Itawamba Co. $70,635; 8.49 mi. F. A. P. 184-F-2 $83,958; 1.4 mi. F. A. P. 184-F-1, $78,918, both Warren Co. Grand total $667,069.

Nevada—State Hy. Comn., Carson City, grading, graveling 19.68 mi. West Slope Mormon Mesa to Lower Virgin River, Clark Co., to Triangle Rock & Gravel Co., West Highland St., San Bernardino, Calif., $68,873. Est. $87,140. Noted Jan. 29.

New Jersey—State Hy. Comn., Trenton, grading, paving 8.96 mi. Atlantic Co., to M. B. Tomlin, 315 Melrose Ave., Atlantic City, $613,023. Noted Feb. 5.

New York—A. W. Brandt, comr. Hys., Albany, bituminous macadam paving 6.41 mi. Cattaraugus Co., to Bero Eng. & Constr. Corp., North Tonawanda, $143,012 est. $187,990—0.84 mi. Oneida Co., to N. D. Peters & Co., Inc., 216 Kossuth St., Utica, $69,775 est. $93,728—grading, bituminous macadam paving Onondaga Co., to C. T. Wilkinson, Buffalo, $240,657 est. $309,518—concrete paving 2.4 mi. Rockland Co., to Waterbury Concrete Constr. Co., Tuxedo Park, $165,780 est. $219,954—2.97 mi. Saratoga Co., to Collins Bros., Stillwater, $169,821 est. $223,091—2.26 mi. Allegany Co., to Rosney Contg. Corp., 533 Colvin St., Buffalo, $95,176 est. $111,735—0.82 mi. Columbia Co., to Carchia & George, Stottville, $34,227 est. $42,162—2.66 mi. Ontario Co., to C. P. Ward, Inc., 135 Ridge Rd., Rochester, $91,667 est. $114,437—0.18 mi. Westchester Co., to Garafano Constr. Co., Inc., Mount Vernon, $148,351 est. $223,416—concrete and bituminous macadam paving 1.16 mi. Warren Co., to R. E. Weber, 246 State St., Schenectady, $123,760 est. $147,709. Grand total $1,282,226. Noted Jan. 29.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, regulating, paving Mundy Ave., to Trifoglio Constr. Co., 349 Carey Ave., West New Brighton, $5,346; regulating Brabant St., to James Kelly, Inc., Martling Ave., Port Richmond, $1,063. Noted Feb. 5.

O., Cleveland—Cuyahoga Co., 10 in. waterbound macadam paving 16,000 sq.yd. Seminary Rd. extension, to Agresta Constr. Co., 4169 Pearl Rd., $31,327. Est. $43,200.

O., Cleveland—Cuyahoga Co., curbing, guttering, vitr. brick paving Fischer Rd., to Rochl Bros., 7002 Denison Ave., $137,088. Noted Dec. 4.

Okla., Tulsa—E. Logan, city and., grading, curbing, guttering, sewers, sidewalks, Class G paving 6,351 sq.yd. 3rd St. Impvt. Dist. 1075, to H. L. Cannady Co., 1116 South Lewis St., $36,756. Est. $40,440.

Okla., Tulsa—Tulsa Co., to Porter Constr. Co., 2503 East King St., grading, curbing, sewers, drainage structures, Class F 7 in. concrete surfacing 1,788 sq.yd. Street Impvt. 1070, Delaware Ave. $6,209; 2,713 sq.yd. Dist. 1071, Main St. $9,928; 13,960 sq.yd. Dist. 1073, Delaware Ave. $3,286; 2,319 sq.yd. Dist. 1074, Boston Pl., $11,187—to Standard Paving Co., 2119 East 11th St., $3,689 sq.yd. Dist. 1072, Delaware Ave. $13,462. Grand total $44,072. Noted Feb. 5.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures 6,127 ft. near Freeport Boro, Greene Co., to McKee & Balazick, Jefferson, $12,675; grading, rein.-con. surfacing 48,280 sq.yd. Ross Twp. and City of Pittsburgh, Allegheny Co., incl. 110 ft. span rein.-con. arch bridge, to R. H. Cunningham & Sons, Turtle Creek, $428,737. Noted Dec. 4.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., Schedule A, curbing and footway work (city to pay) Hy. Dists. 5 and 6, to W. Reeds Sons, 915 South Water St., $1,943—Hy. Dist. 6, to J. Devlin, Jr., Hancock and Thompson Sts., $2,848—Schedule B, curbing and footway work (property owners to pay), Hy. Dist. 1, to Footway Paving Co., 202 North Simpson St., $7,778—Hy. Dist. 2, to J. Zecca, 6441 Vine St., $3,997—Hy. Dist. 3, to Atlas Paving Co., 317 South 6th St., $6,345—Hy. Dists. 5, 6 and 7, to L. Boksey, 1518 North 8th St., $11,343 and $5,102 respectively. Grand total $39,356. Noted Feb. 12.

South Dakota—State Hy. Comn., Pierre, to A. F. Jarvis, Sioux Falls, grading 7.993 mi. Moody Co. $28,283; 7.595 mi. Yankton Co. $18,516; 6.767 mi. Hughes Co. $40,236—to P. G. Thompson, Summit, 10.041 mi. Marshall Co. $29,634—to G. W. Condon Co., 233 Grain Exch. Bldg., Omaha, Neb., 14.36 mi. Meade and Ziebach Counties, $40,730—to G. W. England & Son, Murdo, 9.675 mi. Washabaugh Co. $51,835—to C. L. Yost, Bristow, Ia., graveling 17.11 mi. Campbell Co. $18,637—to T. J. Tobin Constr. Co., Sioux Falls, 30.475 mi. Harding Co. $47,655; 18.397 mi. Hanson and Davison Counties $18,058—to B. Vanderatowe, Hull, Ia., 14.106 mi. Meade Co. $28,087 — to H. Miller, Hartley, Ia., 21.445 mi. Hutchinson and Hanson Counties $14,291—to Northwestern Eng. Co., Rapid City, bridge in Hughes Co. $12,829; graveling 12.846 mi. Fall River Co. $23,786; 14.038 mi. F. A. P. 254A, Bennett Co. $39,994—to Richter & Schuknecht, Parker, 11.388 mi. Hamlin Co. $5,110 — to Summit Constr. Co., Summit, 10.773 mi. Dewey and Ziebach Counties $9,855 — to G. Cronkhite, Perry, Ia. guard rail Clay and Turner Counties $720; Minnehaha Co. $4,584 — to A. Herried, Summit, bridge in Marshall Co. $9,812. Grand total $442,652. Noted Feb. 11 Daily.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, grading, drainage structures 3.474 mi. roads in Shelby Co., to Fite Constr. Co., Dickson, $95,681—3.788 mi. S. A. P. 543-D, Cannon Co., to Lebanon Bridge Co., Gallatin, $29,971—9.432 mi. S. A. P. 543-B, Cannon Co., to K. V. Johnson, Edgefield, S. C., $42,943. Grand total $168,597. Withdrew bids to have been opened Feb. 13, grading, drainage structures 1.15 mi. approaches to Tennessee River Bridge, State Hy. 30, Rhea and Meigs Counties, R. H. Baker, hy. comr. Noted Feb. 5.

Tex., Houston — City, c/o W. E. Monteith, mayor and Harris Co., c/o H. L. Washburn, aud., paving 24 mi. Lyons Ave. between Gregg and Deepwater Sts., 36 ft., to Uvalde Rock Asphalt Co., Post-Dispatch Bldg., $161,697. Est. $200,000. Noted Feb. 5.

Utah — State Rd. Comn., Salt Lake City, grading, surfacing 1.36 mi. Grand Canyon Hy. between Mount Carmel and Sand Plateau, Kane Co., to Utah Constr. Co., Ogden, $87,634. Est. $103,060. Noted Feb. 24 Daily.

Washington—S. J. Humes, dir. Hys., Olympia, clearing, grubbing, bridging 2.517 mi. S.R. 11, Lind East, Adams Co., to Siems Spokane Co., 412 Realty Bldg., Spokane, $64,193—clearing, grubbing, grading 1.218 mi. Bone River to Niawiakum River, S.R. 12, Pacific Co. to Rowland Constr. Co., Inc., 327 Insurance Bldg., Seattle, $70,679—sidewalks on Portage Creek and South Slough Bridges, Snohomish Co., to Mannes & Trester, 4747 41st St. N.E., Seattle, $1,096. Grand total $135,968. Noted Jan. 29.

Const. News page 93

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

O., Cleveland—Bids after June 15, widening Cuyahoga River between Union Terminal Bridge and Big 4 bridge, new piling, bulkhead. $900,000. Total est. $3,250,000. G. B. Sowers, City Hall, engr. Noted Nov. 20.

BIDS ASKED

Louisiana—Mar. 17, by Bd. Comrs. Gravity D. D. 2, Calcasieu Parish (Lake Charles) and Jefferson Davis Parish (Jennings), at residence R. E. Gilson, Iowa, dredging main and lateral canals. $84,000 bond issue sold. A. E. Parent, Bell City, engr. Noted Dec. 18.

La., New Orleans—Mar. 10, by Bd. Comrs. Lake Borgne Basin Levee Dist., A. S. Nunez, pres., 207 New Orleans Court Bldg., Jackson Levee, St. Bernard Parish, incl. 300,000 cu.yd., back protection levee.

Tex., Port Aransas—Gail Borden Munsill Co., Port Aransas, taking bids bulkheads, loading facilities, warehouses, docks, on Harbor Island, near here. Private plans.

CONTRACTS AWARDED

Conn., New Haven—City, P. Wks. Dpt., City Hall, bulkhead at Quinnipiac Park, to Merritt, Chapman & Scott, 292 Pequot Ave., New London, $26,488. Est. $25,000.

Ind., Winchester—Randolph Co., constructing Luzena Hollowell Ditch, incl. 2,172 cu.yd. excav., to R. F. Howell & Sons, Celina, O.

Public Bond Elections

Coming Bond Elections

Waterworks—Lincoln, Neb., Apr. 7, $2,400,000.
Sewage Disposal Plant, Jail, etc.—Duluth, Minn., Apr. 7, $1,730,000.
Sewers—Joplin, Mo., Mar. 12, $275,000.
Sewage Disposal Plant — Las Vegas, Nev., $150,000.
Court House—Los Angeles, Calif., $8,000,000 to $10,000,000.
Asylum—Blackfort, Idaho, State, $250,000.
High School — Charles City, Iowa, Mar. 9, $250,000.
Schools—Sioux City, Iowa, Mar. 9, $600,000.

Bonds Voted

Waterworks Ext. and Playground — Meriden, Conn., $155,000.
Waterworks and Sewers — Waddington, N. Y., $95,000.
Main Extensions—Ponca City, Okla., $36,000. C. F. Hicks, Engr.
Sewers, Sewage Disposal, Lake Front Ext., Park Impvts., Street Widening, etc.—Chicago, Ill., $54,600,000.

Bonds Defeated

Waterworks Ext. and Sewers—Brawley, Calif., $180,000.
Iron Removal Plant—South Sioux City, Neb., $16,000.
Sewers—Gretna, La., $150,000.
School—Saticoy, Calif., $150,000.

FEDERAL GOVERNMENT

BIDS ASKED

Arizona—ROAD—Mar. 12, by C. H. Sweetser, dist. engr. Pub. Rds., 508 Ellis Bldg., Phoenix, grading 2.915 mi. Oak Creek Natl. Forest Hy., Sect. D. R. 7, Coconico Co.

California—ROAD—Mar. 10, by Lighthouse Serv., Custom House, San Francisco, decomposed granite surfacing 2.5 mi. road from Drakes Bay to Point Reyes Lighthouse Reservation, Marin Co.

California — ROAD — Mar. 10, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 6.246 mi. Sect. A, Route 76, Maricopa-Ventura Natl. Forest Hy., Ventura Co.

Calif., Riverside—QUARTERS—Mar. 24 (extended date) at office Con. Q. M., 36 sets non-commissioned officers quarters; 2 sets field officers quarters; 8 sets company officers quarters; Q.M. warehouse, Q.M. maintenance building, Q.M. garage; post exchange, combined guard and firehouse, at March Field; adv. E. N.-R. Mar. 5. Noted Feb. 26.

D. C., Wash.—TRAVELING CRANES, etc.—Mar. 9, by A. L. Flint, purch. agt. Panama Canal, traveling cranes, dipper lips, steel, brass, bronze, copper, sheet lead, monel metal, plate zinc, steel billets, pipe, tubing, wire, etc., Schedule 2633.

Illinois—LOCK GATES—Mar. 14, by U. S. Eng., Chicago Dist., 333 North Michigan Ave., Chicago, furnishing, delivering assembled complete and ready for installation 4 lock gates

Const. News page 94

of 2 leaves each, with anchorage members, mitre still plates, valves, upper pintle castings, mitre and quoin post timbers and bolt fastenings for LaGrange and Kampsville Locks, on Illinois River. W. C. Weeks, dist. engr. adv. E. N.-R. Mar. 5. Noted Jan. 9.

La., New Orleans—QUARTERS—Mar. 19, by Treas. Dpt. at office Sup. Archt., 8 buildings for personnel quarters, at U. S. Marine Hospital. Noted Feb. 12.

La., Shreveport—PIPE—Mar. 17, by Capt. G. E. Lamb, 26,400 lin.ft. 6- to 12-in. pipe at U. S. Airfield.

Md., Fort Hoyle—Mar. 25, at office Con. Q.M., 3 sets non-commissioned officers quarters at Fort Hoyle; adv. E. N.-R. Mar. 5. Noted Nov. 27.

Md., Fort George Meade—QUARTERS—Mar. 26, at office Con. Q.M., 7 single sets non-commissioned officers quarters, adv. E.N.-R. Mar. 5.

Mass., Lawrence—POST OFFICE—Mar. 17, by Treas. Dpt., at office Sup. Archt., 2 story, basement, brick, one steel, 321,000 cu.ft. floor space. $210,000. Noted Dec. 4.

Mich., Detroit—STABLES and QUARTERS—Mar. 30, at office Con. Q.M., Selfridge Field, 2 stables and 3 double non-commissioned officers quarters at Fort Wayne; adv. E. N.-R. Mar. 5.

Mo., Jefferson Barracks—QUARTERS—Apr. 1, at office Con. Q.M., 1 double set non-commissioned officers quarters; adv. E. N.-R. Mar. 5.

Mo., St. Louis—DREDGING PIPE—Mar. 11, at U. S. Eng., furnishing, delivering dredging pipe; adv. E. N.-R. Mar. 5.

Nev., Boulder City—RESIDENCES—Mar. 13, by Bureau Reclamation, Denver, Colo., six 4 room and six 3 room residences for U. S. Govt. Engineers.

New York—DREDGING—Mar. 23, by U. S. Eng., Army Bldg., 39 Whitehall St., New York, 237,500 cu.yd. in Newtown Creek; adv. E. N.-R. Mar. 5.

N. Y., Buffalo—BREAKWATER—Mar. 11, by U. S. Eng., Federal Bldg., repairing 1,699 lin. ft. concrete banquet on old section breakwater, Buffalo Harbor.

N. Y., Mineola—QUARTERS—Mar. 25, at office Con. Q.M., Mitchel Field, 10 double sets non-commissioned officers' quarters; adv. E.N.-R. Mar. 5.

N. Y., Mineola—QUARTERS—Mar. 26, at office Con. Q.M., Mitchel Field, 13 single company officers quarters; adv. E.N.-R. Mar. 5.

N. C., Fort Bragg—QUARTERS—Mar. 26, at office Con. Q.M., three 2 story company officers, three 2 story field officers, six 1 story company officers, and four non-commissioned officers quarters; adv. E. N.-R. Mar. 5.

O., Jackson—POST OFFICE—Mar. 23, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office. Noted Jan. 8.

O., Napoleon—POST OFFICE—Mar. 24, by Treas. Dpt. at office Sup Archt., U. S. Post Office.

Pa., Carlisle — STABLE — Mar. 25, at office Con. Q. M., stable; adv. E. N.-R. Mar. 5.

Tenn., Memphis — DREDGES — Apr. 15, at U. S. Eng., 2 steel hull, self-propelled suction dredges with 32 in. discharges; adv. E. N.-R. Mar. 5.

Tenn., Memphis—BOILER HOUSE, etc.—Mar. 17, by Vet. Bu., Arlington Bldg., boiler house, garage, chimney, incl. roads, grading and removing present stable and servants quarters at U. S. Veterans' Hospital.

Tenn., Memphis — EARTHWORK — Mar. 12, at U. S. Dist. Engineers, 322,000 cu.yd. earthwork in Lower St. Francis Levee Dist.

Tex. Randolph Field—ACADEMIC—Mar. 18, at office Con. Q.M., 2 end wings to academic building; adv. E. N.-R. Mar. 5.

Tex., Randolph Field—GYMNASIUM—Mar. 23, by Con. Q. M. gymnasium. $90,000; adv. E. N.-R. Mar. 5.

Tex., Wichita Falls—POST OFFICE—Treas. Dpt., at office Sup. Archt., bids about May 15, 4 story, basement, brick, steel, rein.-con., Lamar St. near 10th Ave. $550,000. Voelcker & Dixon, Inc., Perkins-Snider Bldg., archts. Noted Feb. 5.

Va., Fort Monroe—QUARTERS—Mar. 27, at office Con. Q.M., 3 double non-commissioned officers' quarters; adv. E.N.-R. Mar. 5.

Va., Langley Field—QUARTERS—Apr. 1, at office Con. Q.M. Fort Monroe, 20 double non-commissioned officers' quarters; adv. E. N.-R. Mar. 5.

Vt., Fort Ethan Allen—QUARTERS—Mar. 25, at office Con. Q.M., constructing, competing 1 double set non-commissioned officers quarters; adv. E. N.-R. Mar. 5.

Wash., Fort Lewis—OFFICERS QUARTERS—Mar. 27, at office Con. Q. M., officers quarters; adv. E. N.-R. Mar. 5.

Wash., Holquiam—POST OFFICE—Apr. 1, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Wyoming—ROAD—Mar. 10, by Pub. Rds., Custom House Bldg., Denver, Colo., grading 17 mi. Project 2-J, Wind River National Forest Hy. Route, Teton Natl. Forest, Teton Co. A. E. Palen, Custom House Bldg., Denver, Colo., dist. engr.

W. Va., Charleston—LOCK—Mar. 16, at U. S. Eng., Huntington, constructing London lock, appurtenances in Great Kanawah River, 24 mi. above here; adv. E. N.-R. Mar. 5. Noted Feb. 26.

CONTRACTS AWARDED

Fla., Pensacola—PAVING—Spec. 6287—Yards & Docks, Navy Dpt., paving and drainage, to Smith Eng. Co., 1624 Barnett Bldg., Jacksonville. Est. $150,000. Noted Jan. 29.

Illinois—LOCK and DAM—U. S. Eng., 1st Chicago Dist., 333 North Michigan Ave., Chicago, completing construction Brandon Road Lock and Dam, on Des Plaines River, to Connolly Contg. Co., 2234 University Ave., St. Paul, Minn., $415,350. This corrects report in Feb. 19 issue.

Illinois—LOCK and DAM—U. S. Eng., 1st Chicago Dist., 333 North Michigan Ave., Chicago, completing Dresden Island Lock and Dam on Illinois River, to Congress Constr. Co., 508 Wabash Ave., Chicago, $848,541. (Awarded about Feb. 15.) Noted Jan. 8.

Ind., Kokomo—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office, to D. Bright, Clinton, $72,600. Noted Jan. 8.

Ky., Louisville—STEEL PONTOONS, etc.—U. S. Eng., P. O. Box 72, 33 steel pontoons, to Jones & Laughlin Steel Corp., Ross St., Pittsburgh, Pa., $32,340; 40 sections steel pipe and 25 flanges, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $9,175. Noted Jan. 22.

Mississippi—EARTHWORK—U. S. Eng., P. O. Box 667, Vicksburg, 363,500 cu.yd. levee, east bank Mississippi River, to R. T. Clark Co., Inc., and Delta Constr. Co., Natchez, at $0.2273 per cu.yd. Noted Feb. 11.

N. Y., New York—DREDGING—U. S. Eng., Army Bldg., 39 Whitehall St., 46,000 cu.yd. Harlem River, to Bridgeport Dredge & Dock Co., 475 5th Ave., $26,249. Noted Feb. 19.

O., Cincinnati—REMODELING—Treas. Dpt. at office Sup. Archt., remodeling U. S. Post Office, to W. MacDonald Constr. Co., Syndicate Trust Bldg., St. Louis, Mo., $10,675. Noted Jan. 29.

Oregon — BRIDGE — Pub. Rds., Portland, bridge on Roosevelt Coast Hy., Sinslaw Natl. Forest, Douglas Co., to T. Lellebo, Reedsport, $45,274.

Tenn., Memphis—STEEL HULL, etc.—U. S. Eng., steel hull for U. S. Dredge Henry Flad, to Dubuque Boat & Boiler Co., Dubuque, Ia., $54,800; turbine and reduction gear, to Murray Iron Wks. Co., Burlington, Ia., $20,968; dredging pump, to Hardie-Tynes Mfg. Co., 800 North 28th St., Birmingham, Ala., $12,793. Grand total $88,561. Noted Jan. 22.

Virginia—DREDGING—U. S. Eng., Norfolk, 700,000 cu.yd. in Harrison Bar, to Standard Dredging Co., 233 Bway., New York; 1,000,000 cu.yd. from Swan Point to Delaware Dredging Co., 139 South 3rd St., Phila., Pa. Noted Jan. 1.

GRADE CROSSINGS

PROPOSED WORK

Mass., Taunton—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, City, and New York, New Haven & Hartford R.R. Co., E. E. Oviatt, ch. engr., New Haven, Conn., grade crossings, overpass, city ways, Winthrop, Somerset and Tremont Sts. $4,500,000. A. W. Dean, Dpt. P. Wks., State House, engr.

CONTRACTS AWARDED

Calif., Santa Cruz—H. E. Miller, clk. Santa Cruz Co., Chittenden Underpass, to C. N. Swenson, 355 Stockton Ave., San Jose, $43,497.

N. Y., Buffalo — City, G. S. Minnis, engr., 1036 Ellicott Sq., grading, drains, sidewalks, asphalt paving approach work in connection with Amherst-Austin, Tonoawanda Streets Grade Crossing, to M. L. Rupp, 46 Haven St., $96,192. Noted Jan. 22.

PIERS AND WHARVES

PROPOSED WORK

Calif., Oakland—PIERS, SHEDS, etc.—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

La., Lake Charles—WHARF EXTENSION, etc.—Lake Charles Harbor & Terminal Dist., doubling present port facilities, extending wharf frontage from 1,600 to 3,600 ft. $700,000.

Mass., Weymouth—PIER, etc.—F. J. Cain, Weymouth, pile, timber pier, foundations, dredging in Fore River, King Cove. $25,000. Private plans.

N. J., Ocean City — PIER — Anglers Fishing Club will not build timber, concrete fishing pier on ocean front, $25,000 or more. Project abandoned. Noted Nov. 13.

AIRPORTS

PROPOSED WORK

Mass., Nantucket — Town, Bd. Selectmen, E. Z. Ryder, airport. $50,000.

BIDS ASKED

Pa., Pittsburgh—Mar. 10, by Bd. Comrs. Juniata Co., J. Armstrong, chn., 73 x 114 ft. T shaped administration building, 30 x 197 ft. Auxiliary building 1, 105 x 152 ft. hangar, at Mifflin Twp. $225,000. S. Roush, 519 Smithfield St., engr.

Pa., Pittsburgh—See "Waterworks."

GRAIN ELEVATORS

PROPOSED WORK

Ia., Sioux City—GRAIN ELEVATOR—Great Northern R.R. Co., St. Paul Minn., J. R. W. Davis, ch. engr., c/o J. P. Donohue, 516 Nebraska St., prelminary plans grain elevator, rein.-con. $500,000.

CONTRACTS AWARDED

Tex., Amarillo—GRAIN ELEVATOR—Burrus Milling Co., Amarillo, and 2701 Alamo St., Dallas, 1,000,000 bu. grain elevator, rein.-con. $120,000. Owner builds. Excavation awarded to J. S. McKnight, 108 Taylor St. L. P. Wallace, structural engr. Noted Feb. 12.

POWER AND LIGHTING

PROPOSED WORK

Me., Portland—Cumberland County Power & Light Co., expending $75,000, constructing conduits in Cumberland Ave., Bramhall, Vaughan and High Sts.

Okla., Boise City—Franchise election Mar. 7, natural gas system to Cimarron Utilities Co. $35,000. Private plans.

Okla., Boynton—Preliminary plans municipal gas system. $30,000. J. Williams, mayor.

Okla., Guthrie—Franchise election Mar. 23, natural gas system to Western Serv. Corp., Braniff Bldg., Oklahoma City. $275,000. Private plans.

Okla., Minco.—Western Serv. Corp., Braniff Bldg., Oklahoma City, granted franchise natural gas distribution system, 525,000. Private plans.

Okla., Mulhall—Mulhall Gas Co. granted franchise natural gas system. $25,000. Private plans.

Okla., Pocassett—Western Serv. Corp., Braniff Bldg., Oklahoma City, granted franchise natural gas system. $25,000. Private plans.

Okla., Tuttle—Western Serv. Corp., Braniff Bldg., Oklahoma City, granted franchise natural gas distribution system. $25,000. Private plans.

Texas — Central Power & Light Co., San Benito, soon lets contract 20 mi. transmission line between San Benito and Brownsville.

BIDS ASKED

Calif., Beverly Hills—Mar. 10, by City Council, furnishing 2,750 ft. 8 and 10 in. c.i. transmission line.

Calif., Culver City—Mar. 16, by City Council, 1 mi. ornamental street lighting system with underground system in Sepulveda Blvd.

CONTRACTS AWARDED

Texas — Central Power & Light Co., Natl. Bank of Commerce Bldg., San Antonio, 70 mi. transmission line between Edinburg and Falfurrias, to Southwest, L. E. Myers Co., Allen Bldg., Dallas, and Del Rio, $52,000. Noted Dec. 25.

PARKS AND SPORTS

PROPOSED WORK

Conn., Meriden—City, P. Wks. Dpt., City Hall, playground development. $75,000 bond issue authorized. C. P. Prann, city engr.

Me., Gorham—Town, Superintendent Schools, plans by Bunker & Savage, 256 Water St., Boston, Mass., 1 story, brick gymnasium at Senior High School. $25,000.

Mass., Attleboro — City, S. M. Stone, chn. Park Comn., animal house at Capron Park. $25,000-$30,000. Engineer not selected.

Mass., Chatham — Town, Bd. Selectmen, recreation park, $25,000 or more. Engineer not selected.

N. J., Jersey City—International Stadium Co., C. Ferrar, pres., Plaza Hotel, rein-con. stadium, $2,000,000. **Maturity about June 1.** F. W. Melbor, 25 West 45th St., New York, engr. Noted Jan. 22.

N. J., Ocean City — Bd. City Comrs., City Hall, new city park, at 6th St. and Atlantic Ave. $50,000. **Maturity about May.** W. K. Collisson, Jr., city engr. Noted Jan. 15.

N. J., West Trenton — Dpt. Institutions & Agencies, State Office Bldg., Trenton, swimming pool, gymnasium, at State Police Barracks. $25,000 or more. **Maturity probably soon.** Div. Architecture & Constr., State Office Bldg., Trenton, engr.

N. Y., New Rochelle — College of New Rochelle, 41 Leland Ave., sports center, incl. gymnasium, stadium. To exceed $200,000.

N. Y., Rockaway Beach—Dpt. Parks, W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, New York, soon takes bids general contract 2 story, 132 x 616 ft. bathing pavilion, Jamaica Bay and Beach 169th St. $450,000. Stoughton & Plock, 250 East 43rd St., New York, archts. Noted Feb. 26.

Tex., Galveston — City, golf course and recreation park. $100,000. J. Bredemus, Milam Bldg., San Antonio, engr. Noted Feb. 5.

BIDS ASKED

N. J., Mays Landing — See "Contracts Awarded."

N. J., North Long Branch—S. A. McNair, 388 Ocean Ave., Long Branch, bids about May 1, general contract 1 story, basement, brick, steel pavilion, 350 bath houses, 150 lockers, reception and shower rooms, Ocean Ave. $150,000. H. I. Braun, 191 Bway., Long Branch, archt. Noted Jan. 29.

N. Y., Babylon — Mar. 17, by Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, walks, broadwalk, marine, boardwalk area, comfort station, refreshment stand, plaza and walks, to underpass, and walks at Jones Beach, Nassau Co. A. E. Howland, ch. engr.; adv. E. N.-R. Mar. 5.

N. Y., Brooklyn — Mar. 10, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, repaving walk areas and constructing concrete benches on west portion Grand Army Plaza and East and West Plaza St.; demolishing old and constructing new wagon shed, in group shops buildings, in Prospect Park, East of Prospect Park W.; near 7th St. entrance; walks and concrete benches on Ocean and Flatbush Aves. bordering Prospect Park.

O., Cleveland—See "Bridges."

CONTRACTS AWARDED

N. J., Mays Landing — Bd. Town Council, Town Hall, improving Memorial Park, incl. grading, concrete walks, new fountain landscape work, day labor. $50,000. Noted Feb. 19.

HEATING AND VENTILATING

PROPOSED WORK

Mass., Pocasset—Maginnis & Walsh, archts., Statler Bldg., Boston, soon take bids heating, plumbing, electrical work in church, for Corpus Christi Roman Catholic Church, G. C. Maxwell, pastor. $25,000. Noted Dec. 11, under "Churches."

BIDS ASKED

Mass., Gloucester — Phillips & Hofloran, archts., Main St., taking bids heating, plumbing, electrical work in nurses' home and ward building, Washington St., for Addison Brooks Gilbert Hospital. $25,000. Noted Feb. 5, under "Hospitals."

N. Y., Hollis — Mar. 10, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electric light and lighting fixtures, in P. S. 35, 90th Ave. from 191st to 192nd Sts., for Bd. Educ., 500 Park Ave., New York.

CONTRACTS AWARDED

R. I., Providence—Jewish Home for Aged, Providence, heating in home, to H. L. Graham & Son, 60 Exchange St., Pawtucket; plumbing, to J. F. Martin Co., Spencer St., Pawtucket; electrical work, to C. & K. Electric Co., 151 Broad St., Providence. Est. $25,000 or more. Noted Jan. 22, under "Buildings-Unclassified."

DAMS

BIDS ASKED

W. Va., Clarksburg—Apr. 3, by Water Bd., S. G. Highland, secy. and genl. mgr., Allen Ford Storage Dam. Fuller & McClintock, 170 Bway., New York, engrs.; adv. E. N.-R. Mar. 5.

UNCLASSIFIED

PROPOSED WORK

Mich., Mohawk—ROCK HOUSE, etc.—Seneca Copper Mining Co., 11 Park Pl., New York, rock house, compressor plant, pumping plant, here and vicinity. To exceed $100,000. **Maturity indefinite.**

N. J., Point Pleasant—BOARDWALK—Bd. Boro Council, Boro Hall, timber, concrete boardwalk from Water St. to south jetty at Manasquan Inlet. $25,000. Engineer not selected.

N. Y., New York—ELEVATORS—S. Levy, pres. Manhattan Boro, Municipal Bldg., replacing 33 elevators with modern high speeed system in Municipal Building. $2,000,000.

N. Y., New York — ELEVATOR — G.A.F. Realty Co., G. A. Fuller, pres., 111 Bway., installing elevator, dumbwaiter, equipment in hotel and commercial building, Madison Ave. and 57th St. $45,000. C. F. Hoppe, 597 Madison Ave., archt.

Pa., Colona—RIVER and RAIL TERMINAL—Pittsburgh & Lake Erie R.R. Co., Pittsburgh and Lake Erie Terminal Bldg., Pittsburgh, A. R. Raymer, ch. engr., mechanical coal handling equipment on Ohio River near Monaca.

Tex., El Paso—COMPRESSOR STATIONS—Western Gas Co. (subsidiary El Paso Natural Gas Co.) El Paso, soon lets contract constructing, equipping 4 complete booster stations for 12 in. gas pipe line between El Paso, Tex. and Douglas and Bisbee, Ariz. $1,000,000. Ford, Bacon & Davis, Inc., 39 Bway., New York, engrs. Stone & Webster Eng. Corp., 49 Federal St., Boston, Mass., will supervise construction. Noted Feb. 5, under "Texas, Arizona and Mexico."

BIDS ASKED

Mass., Oak Bluffs—COMFORT STATION—Mar. 13, by Town, Bd. Health, concrete comfort station, North Bluffs Sect. C. L. Pierce, Vinyard Haven, engr. Noted Jan. 8.

N. Y., Brentwood—ELEVATORS—Apr. 26, by Dpt. Mental Hygiene, State Office Bldg., Albany, elevators at Pilgrim State Hospital. To exceed $40,000.

N. Y., Rochester—LAVATORY, etc.—Apr. 8 by Dpt. Mental Hygiene, State Office Bldg., Albany, lavatory and lavatory equipment at Rochester State Hospital. To exceed $40,000.

Pa., Pittsburgh—GAS MAINS—See "Waterworks."

CONTRACTS AWARDED

Conn., Waterbury — CONCRETE MIXING PLANT—Waterbury Ready Mixed Concrete Co., Bendict St., concrete mixing plant, incl. steel storage tanks, handling equipment. Owner builds. Est. exceeds $25,000. Noted Oct. 23.

Mass., Cambridge—MIXING PLANT—Boston Sand & Gravel Co., 120 1st St., 3 story, brick, 1st St. Owner builds. Private plans.

MATERIALS

PROPOSED WORK

ROAD OIL—**Toms River, N. J.**—Bd. Freeholders Ocean Co., Court House, soon takes bids 600,000 gal. slow curing road oil. $50,000. H. C. Shinn, Municipal Bldg., Lakewood, co. engr.

BIDS ASKED

TAR COLD PATCH, etc.—**Baltimore, Md.**—Mar. 17, by State Roads Comn., G. C. Uhl, chn., 1,000,000 gal. more or less, tar cold patch and 350,000 gal. more or less penetration asphalt. L. H. Steuart, secy.; adv. E. N.-R. Mar. 5.

LUMBER, etc.—**Boston, Mass.**—Mar. 9, by Transit Dpt., 1 Beacon St., long leaf yellow pine and Douglas fir lumber as specified. T. F. Sullivan, chn. Transit Dpt.

ASPHALT CEMENT—**Lansing, Mich.**—Mar. 16, by City, 1,000 tons asphalt cement, for year 1931. B. Ray, city clk.; adv. E. N.-R. Mar. 5.

CEMENT, etc.—**Trenton, N. J.**—Mar. 6, by Dpt. Institutions & Agencies, State Office Bldg., 10,500 bbl. portland cement; 3,150 tons 1½ in. and 3,750 tons ¾ in. wash gravel. C. N. Leathem, State Office Bldg., engr.

CAST IRON PIPE—**New York, N. Y.**—Mar. 6, by P. J. Dooling, comr. Purchase, Municipal Bldg., c.i. pipe, special and valve box castings, valves hydrants, to Dpt. Water Supply, Gas & Electricity; Queens Boro; metals and castings to Dpt. Docks, Parks—Bronx, and Plant and Structures.

CONNECTION SLEEVES, etc.—**New York, N. Y.**—Mar. 13, by P. J. Dooling, comr. Purchase, Municipal Bldg., wet connection sleeves, valves, hydrant parts, to Dpt. Water Supply, Gas & Electricity; wire rope and wire; hose and hose fittings, to Dpts. Parks — Brooklyn and Manhattan, Plant & Structures, Water Supply, Gas & Electricity, Fire and Police Dpts.

SANDSTONE CURBING — **Cleveland, O.** — Mar. 6, by City, 3,500 ft. 5 in. and 500 ft. 7 in. sandstone curbing.

CONCRETE, SAND, etc.—**Phila., Pa.**—Mar. 17, by Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdoch, dir., Schedule C, furnishing, delivering 3,000 tons coarse aggregate (crushed stone or rock); Schedule D, ready mixed portland cement concrete; Schedule E, 3,500 bbl. high early strength portland cement; Schedule F, 2,000 tons concrete sand; Schedule G, insulating steel tank; Schedule H, furnishing street designation signs.

CEMENT, etc. — **London, Ont.**—Mar. 9, by City Engineer, furnishing cement, paving asphalt, broken stone, tile castings. $100,000.

PIPE—**Coalinga, Calif.**—E. McCroskey, city clk., furnishing, delivering 5,000 ft. 1 in. gas pipe, to Bunting Iron Wks., Coalinga, at $8.75 per 100 ft. Noted Jan. 29.

CHECK VALVES—**Los Angeles, Calif.**—T. Oughton, city purch. agt., two 24 in. automatic check valves for use on discharge of centrifugal pump, handling 40 cu.ft. per sec. against 225 ft. head. Spec. 2331, to Waterworks Supply Co., 2326 East 8th St., $3,218.

PIPE, CURB COCKS, etc.—**Los Angeles, Calif.**—T. Oughton, city purch. agt., 90,000 ft. 8 in. and 50,000 ft. 6 in. bell and spigot c.i. water pipe, to R. D. Wood & Co., 110 North Alameda St., at $0.9025 and $0.63 per ft. respectively; galvanized iron water pipe, Spec. 2347, to Santa Fe Pipe & Supply Co., 2451 East 15th St., $4,423; five thousand 2 in. bronze curb cocks, Spec. 2337, to Jones Co., 201 Leroy St., at $1.75 each.

PIPE—**San Francisco, Calif.**—L. S. Leavey, city purch. agt., 35,000 ft. ¼ in. and 3,000 ft. 1 in. standard weight galvanized wrought steel pipe, random lengths, threaded, coupled, to Petroleum Equipment Co., 17th and Connecticut Sts., at $6.03 and $8.59 per 100 ft. respectively.

SERVICE PIPE FITTINGS—**Baltimore, Md.**—Bd. Awards, furnishing, delivering brass service pipe to Bureau Water Supply, to Mueller Co., Decatur, Ill., $8,822.

ASPHALT FABRIC, etc. — **Boston, Mass.** — City, Transit Dpt., 60,000 sq.yd. asphalt saturated waterproofing fabric, to Flintkote Co., Park Sq. Bldg., $7,290; 160 tons asphalt, to Barber Asphalt Co., 109 Cummings St., Roxbury, $3,200.

POST HYDRANTS—**Boston, Mass.**—City, Dpt. P. Wks., 50 post hydrants and 50 gate valves, to McCulloch Mfg. Co., 200 Old Colony Ave., South Boston, $6,607. Noted Feb. 19.

Const. News page 93

Materials (Continued)

CAST IRON PIPE — **Lowell, Mass.** — City, Waterworks Dpt., City Hall, 2,000 tons c.i. pipe, to Lowell Iron & Steel Co., Tanner St., at $39.10 per ton.

SEWER BRICK — **Detroit, Mich.** — Dpt. P. Wks., City Hall, 1,500,000 hard red sewer brick, f.o.b. delivered, to Porath Bros., 10501 Michigan Ave., at $14.20 per 1,000.

WATER PIPE—**Detroit, Mich.**—Dpt. Water Supply, 52,800 ft. 6 in. Delavaud pipe in 12 ft. lengths and 44,200 ft. 8 in. f.o.b. cars Detroit, to U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J., at $0.55 and $0.77 per ft. respectively; 35,000 ft. 8 in. Delavaud pipe in 12 ft. lengths, f.o.b. cars Detroit, to Lynchburg Fdry. Co., Lynchburg, Va., at $0.765 per ft.

WATER PIPE—**St. Paul, Minn.**—City, 37,462 lin.ft. c.i. water pipe, to United States Pipe & Fdry. Co., 625 Plymouth Bldg., Minneapolis, $49,634; 1,422 lin.ft., to Central Fdry. Co., 43rd St. and Lexington Ave., New York, $8,343.

TAR, etc.—**Trenton, N. J.**—Bd. Freeholders Mercer Co., Court House, 64,920 gal. cold tar, 35,610 gal. hot tar, 12,540 gal. warm tar, 12,030 gal. asphaltic oil, 966 tons dustless screenings, 3,210 tons pebbles, 600 tons sand, to Barrett Paving Co. Trenton Trust Bldg., $35,638.

INORGANIC DUST, etc—**New York, N. Y.**—S. Levy, pres. Manhattan Boro, Municipal Bldg., 4,000 tons inorganic dust and 8,000 cu.yd. binder stone, to New York Trap Rock Corp., 250 Park Ave., $24,680 and $15,520 respectively; castings, to Gould Coupler Co., 230 Park Ave., $4,315. Grand total $44,515. Noted Feb. 10.

CONCRETE, etc. — **St. George, N. Y.** — **J. A.** Lynch, pres. Richmond Boro, Boro Hall, Feb. 11, 500 cu.yd. bituminous concrete, to C. F. McAteer, 489 Bay St., $6,250; 50,000 gal. oil, to F. G. Koehler, 2541 Richmond Terrace, Port Richmond, $3,375; 300,000 gal. binder and 60,000 gal. asphalt cement, to Vanbro Constr. Co., 24 Elizabeth St., Port Richmond, $17,420 and $4,200 respectively; 75 tons cement, to Standard Oil Co., 26 Bway., New York, $1,323; 1,000 cu. yd. sand, to J. Johnson Sons, 455 Bway., West New Brighton, $1,550. Grand total $34,218. Noted Feb. 5.

PORTLAND CEMENT — **Milwaukee, Wis.** — City, J. W. Nicholson, purch. agt., 20,000 bbl. more or less portland cement, to Building Material Co-operative, 605 South 12th St., at $2.54 per bbl., credit $0.40 for bags, 5% discount.

PIPE—**Vancouver, B. C.**—City, 15,000 ft. 6 in. and 10,000 ft. 8 in. Class C, Rout-A, Mousson pipe, A.W.W.A., to Pacific Waterworks Supply, Atlantic St. Dock, Seattle, Wash., $33,030; 10,000 ft. 6 in. and 10,000 ft. 8 in. Class B pipe (made in England) to Gordon & Balvea Ltd., 101 Rowell St., $21,243; 15,000 ft. 6 in. and 5,000 ft. 8 in. Class C Delavaud pipe (made in Toronto by Natl. Iron Co.), to Evans Coleman & Evans & Co., Fort Columbia Ave., $15,200. Grand total $59,473.

EQUIPMENT

PROPOSED WORK

DIPPER DREDGE—**West Roxbury, Mass.**—**A.** MacDonald, 55 Worley St., in market dipper dredge.

STEAM ROLLER—**Englewood, N. J.**—Bd. City Council, Municipal Bldg., purchasing 1 steam roller with modern scarifier. $5,200. G. R. Hartley, city engr.

WATER METERS—**Wahpeton, N. D.**—City, A. H. Miller, aud., purchasing 700 water meters.

CONCRETE MIXERS, etc.—**Ohio**—State, O. W. Merrell, hy. dir., Hartman Hotel Bldg., Columbus, in market concrete mixers, trailers, road rollers, motor trucks, asphalt heaters for 2 road repair stations in Cuyahoga Co.

REPAIR SHOP EQUIPMENT—**Montreal, Que.**—S. Hawa, 96 Laurier Ave. W., in market equipment for auto repair shop, garage and service station.

BIDS ASKED

GRADERS—**Buffalo, Minn.**—Mar. 11, by E. R. Anderson, aud. Wright Co,. 2 patrol graders.

MOTOR TRUCK—**Corona, Calif.**—Mar. 10, by A. M. Hinckley, city clk., 1.5 ton motor truck with garbage body, hydraulic lift hoist and overload springs.

MOTOR TRUCK—**Redondo Beach, Calif.**—Mar. 12, by C. C. Mangold, city clk., 1½ ton motor truck with stake body and hydraulic hoist for rubbish collection.

TRUCK, OIL, etc.—**Allison, Ia.**—Mar. 9, at office Auditor Butler Co., 1½ ton truck, 3 cars fir bridge lumber, 28 bbl. lubricating oil R. B. Girton, Allison, co. engr.

GENERATING PLANT—**Cliffside, N. J.**—Bd. Boro Council, Boro Hall, bids about Mar. 15, furnishing, installing ozone generating plant unit machine in pumping station, Aurora and West End Aves. $5,000. McClave & McClave, 600 Gorge Rd., boro engrs.

TRACTOR TRUCK, etc.—**Bismarck, N. D.**—Mar. 16, by State Hy. Dpt., H. C. Frahm, ch. engr., one 4-wheel drive tractor truck; 22 pneumatic-tired, industrial wheel type tractor trucks, (17 to 35 drawbar horse power); 7 motor patrols; 10-20 drawbar blade graders; 1 elevating grader; 2 portable gravel loaders.

Const. News page 96

ROAD ROLLERS, etc.—**Cleveland, O.**—Mar. 6, by City, 1 or more road rollers, portable air compressors, 2 wheel trailers.

TRACTOR and GRADER—**Brenham, Tex.**—Mar. 9, by Washington Co., c/o S. D. W. Low, judge, 1 small tractor and 1 road grader.

TRACTOR—**Brownsville, Tex.**—Mar. 13, by City, c/o H. Van Horn, secy., 1 crawler type tractor, 5 to 7½ tons.

CONTRACTS AWARDED

JAIL EQUIPMENT—**Beaumont, Tex.**—Jefferson Co., c/o B. J. Johnson, judge, purchasing jail equipment to Southern Prison Co., 4500 South Presa St., San Antonio, $53,442. Noted Dec. 25, under "Unclassified."

FOREIGN

Australia, New South Wales, Sydney—Apr. 8, by Government Railways Manager, one 2,500 kw. alternator for Lithgow Power Station.

China, Shanghai—Sept. 1, by Whangpoo Conservancy Bd., constructing, supplying 1 drag suction hopper dredger, of seagoing unanchored type with 25,000 cu.yd. Yangtze consolidated silt, mud, or sand per day of 10 working hours, incl. 2 mi. haulage per load to dump, dumping and return for use on Fairy Flats (Yangtze Bar) Dredging Project, notification 198. H. Chatley, engr.-in-chief; adv. E.N.-R. Mar. 5.

Mexico—State Tamaulipas, asphalt on rock paving 50 mi. road from Matamoros to Reynosa, to Agar & Gentry, San Benito, Tex., 400,000 pesos.

New Zealand, Wellington—Apr. 2, by Port & Telegraph Dpt., 8,807 yd. 28 pair multiple twin lead covered telephone cable.

New Zealand, Wellington—Apr. 28, by Secretary Post & Telegraph Dpt., one 5,000 kw. 66/100 to 33/100 volt transformers for Lake Coleridge.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Mass., Dorchester (br. Boston)—Owner, c/o R. M. Stowell, archt., 163 Country Club Rd., Newton, soon takes bids two 3 story, basement, brick, steel, stone, concrete founds., at Talbot Ave. and Peabody Sq. $170,000.

Mass., Malden (br. Boston) — **Owner, c/o Eisenberg & Feer, archts., 11 Beacon St., Boston,** taking bids 4 story, basement, brick, steel plain found., Main St. To exceed $150,000.

Mass., Roxbury (sta. Boston) — See "Contracts Awarded."

N. J., Elizabeth—See "Contracts Awarded."

N. Y., Bronxville—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Hastings—See "Contracts Awarded."

N. Y., Mount Vernon — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., St. George—See "Contracts Awarded."

Pa., Pittsburgh—H. Kamin, 5862 Forbes St., taking bids two 3 story basement, 64 x 66 ft., brick, hollow tile, Park Lane. Owner awards separate contracts. N. Leebov, 507 Jones Law Bldg., archt.

Pa., Wellsboro—Wellsboro Hotel Co., taking bids 4 story, basement, 40 x 54 ft., brick addition, incl. dining room, kitchen, telegraph office, plain found., Main St. $150,000. W. H. Lee, Schaff Bldg., Phila., archt.

CONTRACTS AWARDED

Mass., Roxbury (sta. Boston) — **R. & R.** Constr. Co., 43 Tremont St., Boston, (2 units) 4 story, basement, 175 x 175 ft., brick, plain found., Hutchins and Seaver Sts., separate contracts. $200,000. S. E. Moffie, 43 Tremont St., Boston, archts.

N. J., Asbury Park—C. E. Van Wickle, 501 Grand Ave., general contract 6 story, basement, brick, steel, to J. W. Brooks, 94 Corlies St. Est. $400,000. Noted Jan. 29.

N. J., Elizabeth—Owner, c/o J. Anderson, archt., 251 North Broad St., 5 story, basement, brick, steel, plain found., separate contracts. $200,000.

N. J., Princeton—Nassau Tavern, Inc., general contract 2, 3, 4 and 6 story, basement, 100 x 220 ft., brick, steel hotel, plain found., Nassau St., to Matthews Constr. Co. 285 Madison Ave. New York. Est. $1,000,000. Contractor taking bids on separate contracts.

N. M., Clovis—Southern National Hotel Co., c/o F. Canady, Galveston, Tex., general contract 9 story, 48 x 110 ft., brick, steel hotel, stores, 36,000 sq.ft. floor space, to H. W. Churchill Constr. Co., Ind. Bldg., Dallas, Tex. Est. $286,500. Noted Feb. 5.

N. Y., Bronxville—Corporation, c/o Conte & Zuccaro, 21 Hillside Pl., Tuckahoe, 2 story, Travers Pl., day labor. $200,000.

N. Y., Brooklyn—W. M. Calder Co., 2703 Avenue U, 2 story apartment, Cayle St. and Avenue W, day labor and separate contracts. $150,000. J. A. Boyle, 367 Fulton St., archt.

N. Y., Brooklyn—East 26th Street Building Corp., 2620 Glenwod Rd., 6 story, East 27th St. and Glenwood Rd., separate contracts. $200,000. Cohn Bros., 363 Stone St., archts.

N. Y., Brooklyn—Herbert View Corp., H. Schneider, pres., 16 Court St., apartment, Avenue R and Burnett St., separate contracts. $150,000. I. Kallich, 26 Court St., archt.

N. Y., Hastings—Bway.-Hastings Corp., 250 Park Ave., New York, apartment, 465 Bway., separate contracts. $200,000. E. D. Parmelee, 260 North Ave., New Rochelle, archt.

N. Y., Mount Vernon—Grand Garden, Inc., 11 West Prospect St., apartments, Grand St., separate contracts. $150,000. Sterns & Peyser, 9 West Prospect St., archts.

N. Y., New York—Academy Housing Corp., 1750 Randall Ave., 6 story, 65 x 138 ft., vicinity of Rosedale and Randall Aves., separate contracts. $250,000. Springsteen & Goldhammer, 40 East 49th St., archts.

N. Y., New York—S. Aginsky, 2685 University Ave., 6 story, basement, Marion Ave. and 184th St., separate contracts. $150,000. Boak & Paris, 10 East 40th St., archts.

N. Y., New York—D. Cioffi, 648 Rosedale Ave., 6 story, basement, Eastlawn Ave. and 174th St., separate contracts. $150,000. G. W. Swiller, 4215 3rd Ave., archt.

N. Y., New York—Madison Properties, Inc., R. Beneson, pres., 295 Madison Ave., 6 story, Gun Hill Rd. and Putnam Pl., separate contracts. $400,000. H. Ginsberg, 205 East 42nd St., archt.

N. Y., New York—R. F. L. Realty Corp., G. Halpern, pres., 414 East 20th St., 6 story, 84 x 98 ft., Gun Hill Rd. and Knox Pl., separate contracts. $180,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., archts.

N. Y., New York—Stola Mason Contg. Co., 3224 Perry Ave., 6 story, 80 x 90 ft., 230th St. and White Plains Ave., day labor and separate contracts. $150,000. M. W. Del Gaudio, 545 5th Ave., archt.

N. Y., St. George—Rosjen Land Co., M. Dorfman, pres., 80 St. Marks Pl., 6 story, basement, 100 x 150 ft., brick, steel, plain found., Hart and Forrest Aves., separate contracts. $250,000. Cohn Bros., 215 Montague St., Brooklyn, archts.

CLUBS

PROPOSED WORK

Mass., Northampton—Smith College, A. Snow, secy. Alumnae Assn., Alumnae Clubhouse, campus. $150,000 or more. Architect not selected.

N. J., Freehold — Knights of Columbus, 2 story, basement, brick, steel club house, plain found. $150,000. Project in abeyance. E. H. Schmeider, 3rd Ave., Spring Lake, archts. Noted Jan. 29.

N. J., Newark—Contemporary Club, O. L. Butcher, chn., 150 South Clinton St., East Orange, sketches club house. $150,000.

N. J., West Orange—Essex County Country Club, Hutton Park, altering and constructing 2 story, basement, brick, steel addition. $150,000. **Maturity indefinite.** Architect not selected. Noted Feb. 12.

HOSPITALS

PROPOSED WORK

Conn., Hartford—State, State Health Dpt., F. Salmon, comptroller, new State Health Building, Buckingham St. To exceed $150,000. Architect not selected.

Conn., Hartford—State, Cedarcrest Sanatorium, plans by V. E. Kinney, 256 Main St., Derby, brick, steel nurses home, infirmaries, at State Sanatorium. $225,000. Noted Feb. 19.

Conn., Norwich—State, Hospital for Insane, plans by Cudworth & Thompson, Disco Bldg., nurses home $135,000, 2 cottages $27,000, hall addition $36,000. Noted Feb. 19.

Ga., Waycross — Comrs. Ware Co. plans by S. R. Fetner, 32 West Forsyth St., Jacksonville, Fla., hospital, nurses home. $150,000. Noted Mar. 27, 1930.

Me., Bangor—Bangor State Hospital, C. J. Hedin, supt., sketches by Crowell & Lancaster, Exchange Bldg., 3 story, basement, brick nurses home. $150,000.

Mass., Norfolk — Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, sketches by McLaughlin & Burr, 88 Tremont St., Boston, brick hospital at State Prison Colony, to exceed $150,000; various farm buildings at State Prison Colony, $150,000 or more.

Mass., Northampton—Hampshire Co. Comm., Hampshire County Court House, plans by F. M. Mahoney, 190 Main St., hospital addition, nurses home. $150,000 or more.

Mass., Waltham — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, soon takes bids 4 story, basement, brick medical and surgical building at Metropolitan State Hospital. $400,000. G. Robb, 14 Beacon St., Boston, archt.

Hospitals (Continued)

N. J., Jersey City—Fairmount Private Hospital, O. R. Blanchard, chn. comn., 136 Summit Ave., 8 story, basement hospital addition. $150,000 or more. **Maturity probably soon.** Architect not selected.

N. J., Jersey City—Bd. City Comrs., Court House, 15 story, basement, brick, steel psychopathic hospital. Baldwin and Montgomery Sts. $150,000. Project in abeyance. J. T. Rowland, Jr., 30 Journal Sq., archt. Noted Jan. 8.

N. Y., Eastview—Bd. Supervs. Westchester Co., F. L. Merritt, clk., by Walker & Gillette, 599 Madison Ave., New York, Elmwood Hall additions at Grasslands. Contractors to submit qualifications to Commissioner Budget & Accounts, Court House, White Plains not later than Mar. 14; adv. E.N.-R. Mar. 5.

N. C., New Bern—Craven, Pamlico, Onslow and Jones Counties, joint charity hospital, $150,000. Half of cost to be borne by counties and balance from Duke Endowment, Charlotte. Address Craven Co. Bd. Comrs., New Bern.

Tex., Beaumont — Hotel Dieu Hospital, operated by Sisters of Charity of Incarnate Work, M. Plasidus, mother superior, Beaumont and Houston, altering and constructing hospital wing, remodeling old hospital building, construcure fireproof, plant, nurses' home, chapel, sisters' home, all brick, steel, rein.-con., plain found. $500,000. Private plans.

Vt., Waterbury—Vermont State Hospital for Insane, W. H. Dyer, State House, Montpelier, dormitory. $150,000. Architect not selected.

BIDS ASKED

Conn., Willimantic—St. Joseph's Hospital, 88 Jackson St., J. F. Carr, pres. trustees, bids about May 1, general contract hospital. Crow, Lewis & Wick, 200 5th Ave., New York, archts. Noted Jan. 8.

La., New Orleans—Mar. 19, at office M. H. Goldstein, archt., Amer. Bank Bldg., unit of Dillard Memorial University for Negroes, incl. 4 story basement, 51 x 136 ft., rein.-con., brick, cast stone, terra cotta main building, concrete pile found., 2 story, 30 x 140 ft., timber, stucco nurses home, 1 story, 22 x 53 ft., brick, hollow tile service building, all on 250 x 320 ft. site, Louisiana Ave., La Salle Toledano and Freret Sts., for Flint-Goodrich Hospital, 1566 Canal St.

Miss., Jackson—Mar. 21, by Bd. Comrs. State Hospital, Removal Comn., 11 new hospital buildings for State Hospital for Insane, Rankin Co., near here. $800,000. N. W. Overstreet, Jackson, archt. Noted Jan. 15.

N. J., Holmdel—Mar. 16, by C. N. Leathem, Jr., archt., State Office Bldg., Trenton, general contract reception and treatment hospital, for Dpt. Institutions & Agencies, Trenton. $800,000. Noted Feb. 19.

N. Y., Middletown — Apr. 1, by Dpt. Mental Hygiene, State Office Bldg., Albany, reconstructing and constructing hospital addition, at Middletown State Hospital. $150,000.

N. Y., New York — Mar. 12, by J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., altering and constructing addition to main building at Lincoln Hospital, Concord Ave. and East 141st St. C. B. Meyers, 31 Union Sq. W., archt. Former bids rejected. Noted Feb. 19.

N. Y., West Haverstraw—Mar. 16, by Dpt. Standards & Purchase, State Office Bldg., Albany, dormitories at New York State Orthopedic Hospital. $150,000.

O., Springfield—Mar. 9, by City, 4 story hospital. $1,500,000. M. W. Lethley, Springfield, archt. Eastman & Budke, Springfield, archts.

Pa., Byberry—Mar. 10, by Dpt. Pub. Health, City Hall, Phila., c/o A. A. Cairns, 2½ story, basement, 79x162 ft. infirmary, 2 story, 38x164 ft.—38x50 ft. physicians building, 27x32 ft. —38x151 ft. female attendants building, all steel, brick, plain. founds. P. H. Johnson, Architects Bldg., Phila., archt.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co., plastering contract for Acute Unit of County Hospital, to J. W. Dean, 6778 Hollywood Blvd., $304,475. Noted Oct. 9.

Massachusetts — Middlesex Co., East Cambridge, 1 and 2 story, brick, concrete, steel recreation building, dormitories, nurses' home, plain founds., at Metropolitan Hospital, Waltham and Lexington, to C. S. Cunningham & Sons, Statler Bldg., Boston. Est. exceeds $150,000. Noted Jan. 29.

Minn., St. Paul—Charles T. Miller Hospital, 125 College Ave., general contract 5 story, basement, brick, rein.-con., stone nurses' home, 125 College Ave., tentatively awarded to E. Bjorklund, 914 Builders Exch. $200,000. Noted Feb. 5.

N. Y., New York — New York Orthopedic Hospital, 420 Lexington Ave., 5 story hospital addition, to Marc Eidlitz, 100 East 42nd St. Est. $300,000. Noted Feb. 26.

CHURCHES

PROPOSED WORK

Calif., Newport Beach—Methodist Episcopal Church, R. Stroup, pastor, plans by F. W. Stevenson, Spreckels Theatre Bldg., San Diego, rein.-con. church. $150,000.

Conn., Bridgeport — St. Paul's Episcopal Church, G. M. Geisel, pastor, 592 Kossuth St., rebuilding 1 story, basement, brick church, Kossuth and Beach Sts., recently destroyed by fire. $150,000. Architect not selected.

Conn., Bridgeport—St. Cyril and Methodius Roman Catholic Church, C. J. Panik, pastor, 79 Church St., convent, parish house, Church St. To exceed $150,000. Architect selected soon.

Ind., West Lafayette—University Presbyterian Church sketches brick, steel, stone community building near Purdue Campus. $200,000. Architect not selected.

Mass., Marlboro—St. Mary's Roman Catholic Church, J. L. Levesque, pastor, 26 Broad St., sketches by H. G. Morissette, 575 Essex St., Lawrence, 1 story, basement, 65 x 125 ft., brick, stone, Broad St. $150,000.

N. J., Guttenburg—Little Church on the Hill, D. R. Reese, pastor, 3208 24th St., will not build 2 story, basement, brick, steel, rein.-con. church, Sunday school, plain found., Bergenline Ave. $150,000. Project abandoned. Noted Jan. 29.

N. J., Jersey City — Monumental Baptist Church, W. S. Smith, pastor, 18 Atlantic St., 3 story, basement, 50 x 100 ft., brick, steel, Atlantic St. $150,000. Project in abeyance. J. Armstrong, 36 Gautier Ave., archt. Noted Feb. 26.

N. J., Newark — Owner, c/o H. J. Weiler, archt., 40 Komorn St., Newark, 2 story, basement, brick, steel church, Oliver St. between Adams and Van Buren Sts. $150,000.

N. J., Newark—Second Presbyterian Church, L. H. Clee, pastor, 294 Mount Prospect Ave., sketches by W. B. Willis, 111 Madison Ave., New York, rebuilding 2 story, basement, brick, steel church, James and Washington Sts. $250,000. Noted Feb. 13.

N. J., South River — Conceklin Methodist Church will not build 1 and 2 story, tower, brick, steel, rein.-con. church, Main and Gordon Sts. $150,000. Project abandoned. Noted Feb. 5.

N. J., Trenton — Episcopal Diocese New Jersey, P. Matthews, bishop, Princeton, cathedral, West State St. and Overbrook Ave. $1,000,000. Architect not selected.

Tex., Amarillo—First Christian Church, J. W. Hill, chn. building com., church, 1301 Madison St. $300,000. Architect not selected.

BIDS ASKED

N. J., Elizabeth—Fanning & Shaw, archts., 49 Ward St., Paterson, taking bids 2 story, basement, brick, steel chapel, plain found., for Benedictine Sisters, c/o architect. $150,000.

N. Y., New York — Mar. 9, by Fourth Church of Christ Scientist, Fort Washington Ave. and 178th St., general contract church, Fort Washington Ave. and 185th St. $200,000. Cherry & Matz, 441 Lexington Ave., archts. Noted Feb. 12.

CONTRACTS AWARDED

Md., Baltimore — Mottu & White, archts., Baltimore Life Bldg., brick, hollow tile, church, to Tase, Norris & Co., 903 Cathedral St., for St. Bartholomew's P. E. Church, c/o architects. $150,000. Noted Feb. 5.

Mass., Pocasset — Corpus Christi Roman Catholic Church, G. C. Maxwell, pastor, 1 story, basement, brick, stone, plain found., to Chas. H. Hodgate Co., 370 Bedford St., Fall River. Est. $150,000. Noted Dec. 11.

Ont., Ottawa—Dominican Order, brick, rein.-con. monastery, plain found., to H. Dagenais, Ottawa, $150,000.

SCHOOLS

PROPOSED WORK

N. Y., New York—Bd. Educ., approves building program for 1931, ninety new schools and additions in five boroughs. Total $68,000,000.

N. J., Newark—Bd. Educ., City Hall, Junior and Senior High School, brick, steel, rein.-con., Hobson St., Summit and Goldsmith Aves. $1,000,000. **Maturity probably soon.** Architect not selected.

BIDS ASKED

Calif., Alhambra—Mar. 5, by Bd. Educ., 2 story, basement, 115 x 200 ft., rein.-con., brick. $150,000. Noted Sept. 25.

Conn., Stamford — City, Bd. Educ., taking bids altering and constructing 2 story, basement, brick, steel addition to Belltown School, incl. auditorium, concrete found. $150,000. Emmens & Abbott, 1 Bank St., archts.

Ind., Wheatfield—Schools Comrs. bids about Apr. 1, brick, steel school. $150,000. J. R. Bruck, Kentland, archt. Noted Feb. 5.

La., New Orleans—Mar. 30, by A. A. Vidrine, Charity Hospital, Medical Center Building, 7 story, 54x200 ft., rein.-con., brick, limestone, woodpile found., Tulane St., for Louisiana State College, Baton Rouge. $480,000. Weiss, Dreyfus & Seyferth, Inc., Maison Blanche Bldg., archts. Noted Jan. 29.

Mass., Dover—Mar. 10, by Town, M. W. Comisky, chn. com. and Shepard & Stearns, archts., 65 Franklin St., Boston, Junior and Senior High School, 2 story, basement, 75x120 ft., brick, stone, concrete, granite, plain found., Springdale Ave. $150,000. Noted Nov. 6.

N. J., Bloomfield—Bd. Educ. bids about June 1, 2 story, basement, brick, steel, rein.-con., plain found., Broughton and Watchung Aves. $350,000. Bartlett & Marsh, Lefcourt Bldg., Newark, archts. Noted Feb. 5.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Apr. 15, altering and constructing 2 story school addition, Grove St. $150,000. Schneider, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted Feb. 26.

N. J., Manasquan—Mar. 23, by Bd. Educ., 2 story, 98 x 303 ft. high school, North Broad St. $250,000. Coffin & Coffin, 522 5th Ave., New York, archts. Noted Feb. 19.

N. J., Trenton—Mar. 10, by State Bd. Educ., State House Annex, general contract 2 story, basement, 160 x 175 ft., brick, steel, rein.-con. addition to Teacher's College, Lake Blvd. between Lawrenceville and Pennington Rds. $375,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Feb. 19.

N. J., Trenton—School of Industrial Arts, M. F rederick, in charge, West State St., taking bids 2 story, basement, brick, steel art school addition, plain found., West State and Willow Sts. $150,000. Cass Gilbert, 224 Madison Ave., New York, archts.

N. J., Wyckoff — Mar. 17, by Bd. Educ., School Bldg., general contract 2 story, basement, brick, steel, Grand View Ave. $150,000. Lee & Hewitt, 152 Market St., Paterson, archts. Noted Feb. 26.

N. Y., Alfred—Apr. 30, by Alfred University, clay working, ceramics workshop and school building. $150,000. Childs & Smith, 720 Michigan Ave., Chicago, Ill., archts. Noted Feb. 21, 1929.

N. Y., Great Neck—Bd. Educ., bids about Apr. 1, 2 story, basement, brick, steel school, $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Feb. 12.

N. Y., Ithaca — Mar. 19, by Commissioner Dpt. Educ., State Educ. Bldg., Albany, foundation for agricultural economics, marking and farm management building, Cornell University; adv. E. N.-R. Mar. 5.

N. Y., Oswego—Mar. 26 (extended date), by Commissioner Dpt. Educ., Education Bldg., Albany, Industrial Teachers Training Building, at State Normal School; adv. E. N.-R. Mar. 5. Noted Feb. 26.

O., Cincinnati—Mar. 6, by Garber & Woodward, archts., 616 Walnut St., 3 and 6 story, basement, 60 x 160 ft., brick, rein.-con. botany and zoology building, plain found., campus, for University of Cincinnati, Clifton Ave. $400,000. Noted Oct. 23.

Pa., Williamsport—Mar. 9, by H. A. Sterner, city secy., 229 West 3rd St., 3 story, basement, brick, plain found., Otto St. $175,000. W. D. Shollenberger, 11-17 West 4th St., archt.

S. D., Aberdeen—Mar. 10, by Bd. Educ. at office Superintendent Schools, general contract school J. W. Henry, Aberdeen, archt. Rose & Harris, 430 Oak Grove, Minneapolis, Minn., engrs.

Va., Charlottesville—Mar. 12, by Architectural Comn., J. K. Peebles, chn., Law Building, 2 story, basement, 200 x 207 ft., steel, brick, cut stone, concrete law building, for University of Virginia. $225,000. Noted Feb. 26.

Wash., Renton—W. Mallis, archt., Lyon Bldg., Seattle, bids about Mar. 3, 3 story, basement, 116x235 ft., brick school, incl. gymnasium, assembly hall, for School Dist. 7, King Co. $200,000. Noted Jan. 8.

Wis., Oshkosh—Mar. 9, by Mercy Hospital, general contract 6 story, 43 x 152 ft. school of nursing, East Oak St. E. Brielmaier & Son Co., 425 East Water St., Milwaukee, archts.

CONTRACTS AWARDED

Calif., Los Angeles—R. Montgomery, archt., Chamber of Commerce Bldg., 2 story, 60 x 285 ft., brick administration and residential building, to Macdonald & Driver, Bd. Trade Bldg., for Marymount School Corp., c/o architect. $350,000. Noted Feb. 12.

Calif., Sawtelle—City of Los Angeles School Dist., general contract 2 story Class A rein.-con. school auditorium, to J. F. Kobler, 932 Rimpau Blvd., Los Angeles, $124,886.

Conn., Hartford — Trinity College, R. B. Ogilby, pres., 1 story, 30 x 85 ft., 4 story, 35 x 175 ft., and 3 story, 25 x 36 ft., brick, stone dormitories, to A. F. Peaslee, Inc., 15 Lewis St. Est. exceeds $200,000. Noted Feb. 5.

Conn., New Haven — Yale University, T. G. Farnham, 5 story dormitories quadrangle, Elm St., to Marc Eidlitz & Son, 100 East 42nd St., New York. Est. exceeds $600,000.

Ind., Indianapolis — School Comrs., A. B. Good, dir., School 82, 2 story, basement, rein.-con., brick, to Service Constr. Co., 301 Castle Hall, $136,268; plumbing and heating, to Freyn Bros., 328 North Illinois St., $35,945, electric wiring, to Porter-Globe & Glass, Inc., 215 Hudson St., $6,690. Grand total $178,903.

Ind., Richmond—School Comrs., general contract Hibbard and Joseph Moore Schools, to Immel Constr. Co., Fond du Lac, Wis., Nicholson and Test Schools, to J. W. Meller Co., Richmond. Est. $228,000. Noted Jan. 15.

La., Monroe—Ouachita Parish School Bd., general contract Junior College 3 story, rein.-con., brick, to Ashton Glassell Co., Shreveport $189,400; plumbing and heating, to W. J. Riley, Monroe, $46,925; electric wiring, to Odom Electric Co., Monroe, $26,790. Grand total $263,115. Noted Jan. 29.

Const. News page 97

Schools (Continued)

Md., Baltimore—Bd. Awards, City Hall, 2 story, basement, brick, concrete, hollow tile, steel school, to J. L. Robinson Contg. Co., 522 Park Ave., $134,077. Noted Feb. 5.

Md., Baltimore — Mottu & White, archts., Baltimore Trust Bldg., 2 story, basement, irregular sized, stone, to Davis Contg. Co., 9 West Chase St., for Friends School, W. S. Pike, headmaster, Park Ave. and Laurens St. $150,000. Noted Feb. 26.

N. Y., Troy—Rensselaer Polytechnic Institute, two 3 story, 65 x 149 ft. dormitories, to Amsterdam Building Co., 441 Lexington Ave., New York. Est. $268,000.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, general contract P. S. 228 (David A. Boody Junior High School), to Crest Eng. Co., 5 Columbus Circle, New York, $233,300. Noted Jan. 22.

N. Y., New York—Bd. Educ., 500 Park Ave., general contract Samuel Gompers Industrial High School for Boys, to Psaty & Fuhrman, Inc., 369 Lexington Ave., $1,015,000. Noted Jan. 22.

N. Y., Syracuse—Commissioner Dpt. Education, Education Bldg., Albany, general contract Forestry Science Building at New York State College Forestry, Syracuse University, to C. M. McLean & Son, Inc., 332 Water St., Binghamton, $104,000; sanitary work, to J. B. Duffy, Inc., 342 Madison Ave., New York, $29,374; heating, to Bresnahan Co., Inc., 60 East Ferry St., Buffalo, $46,641; electrical work, to Industrial Power Installation Corp., 205 Arcade Bldg., $17,375. Grand total $197,390. Noted Nov. 20.

O., Cincinnati—Hamilton Co. Court House, 6 story, basement, 54 x 151 ft., brick, rein.-con. hospital, plain found., Guerley Rd., from Hodges Constr. Co., Chamber of Commerce, $500,789.

O., Wooster—Wooster College, 2 story, basement, 48 x 108 ft., white Kitanning brick and Indiana limestone, administration building, North Beverly St., to Crowell & Little, Hanna Bldg., Cleveland. Est. $150,000.

THEATRES

PROPOSED WORK

Calif., Whittier—A. Wardman, plans by D. S. Bushnell, Warner Bros. Theatre Bldg., Los Angeles, 1,000 seating capacity, Class A rein.-con. theatre, $150,000.

Mass., Boston—Adams House Realty Corp., H. K. Noyes, pres., 857 Commonwealth Ave., recalled plans 1 story, basement, 80 x 220 ft., brick, concrete, steel theatre, plain found., Washington St., Old Adams House Site. To exceed $150,000, Will take new bids later. A. H. Bowditch, 44 Bromfield St., archt. Noted Feb. 19.

Mass., Boston — Terminal Theatre Co., N. Thompson, 312 Congress St., plans by Hendrick & Haywood, 192 Boylston St., and soon takes bids 1 story, basement, brick, steel, granite, plain found., Dorchester Ave., in South Station Sect. To exceed $150,000. Noted Feb. 5.

N. J., Asbury Park—Warner Bros., 2 story, basement, brick, steel, plain found., Lake Dr. $250,000, **Maturity in December.** Noted June 5.

N. J., Elizabeth—C. H. Schlichter, 556 North Broad St., 2 story, basement, brick, steel, rein.-con. theatre, office, 556 Broad St. $450,000. **Maturity about June.** Poggi & Bragdon, 275 Morris Ave., archts. Noted Oct. 23.

N. J., Red Bank—Red Bank Amusement Co., c/o Boylan & Levine, archts., 143 Albany St., New Brunswick, 2 story, basement, brick, steel theatre, plain found. $150,000. Noted Feb. 19.

Ont., Ottawa—C. Burgess, archt., Ottawa, soon takes bids 60 x 102 ft., brick, rein-con. theatre, plain found., Rideau St., for A. H. and S. Caplan, Ottawa. $200,000.

CONTRACTS AWARDED

Mass., Fitchburg — Cofman Estate, H. C. Cofman, 105 Main St., 1 story, basement, brick, steel theatre, incl. bowling alleys, pool room, plain found., Main St., separate contracts, $150,000 or more. Private plans.

BANKS

PROPOSED WORK

Conn., Waterbury—Merchant's Trust Co., 67 Bank St., H. Weyland, pres., plans by E. F. Strassle, 6 East 46th St., New York, brick, steel bank, Leavenworth St. Est. exceeds $150,000. **Maturity late in April.**

Mass., Somerville (br. Boston)—Winter Hill Co-operative Bank, G. Lovejoy, pres., and Desmond & Lord, archts., 1 Beacon St., Boston, soon lets contract 1 and 3 story, basement, irregular sized brick, stone, steel, concrete, granite, plain found., Cutter Sq. $250,000. Noted Jan. 29.

Mass., Weymouth—Weymouth Trust Co., 92 Pleasant St., and Harper & West, archts., 92 State St., Boston, soon lets contract 1 story, basement, brick, stone, concrete, steel bank, concrete found., Washington St. corner Prospect St. $150,000. Noted Jan. 29.

Pa., Athens—Athens Natl. Bank plans by D. A. Keefe, Athens, 2 story, basement, 40 x 150 ft., rein.-con., brick, plain found., Main St. $150,000.

BIDS ASKED

Conn., Mystic—Mar. 6, by Mystic River Natl. Bank, E. S. Huntley, pres., brick, stone bank, $150,000. Harper & West, 92 State St., Boston, Mass., archts. Noted Feb. 5.

N. J., Madison—Madison Trust Co., Main St., bids about Mar. 15, general contract 1 story, basement, brick, steel bank, 18-22 Waverly Pl. $150,000. E. F. Strassle, 6 East 46th St., New York, archt. Noted Feb. 26.

CONTRACTS AWARDED

Va., Richmond — Morris Plan Bank of Virginia, T. C. Boushall, pres. (1st unit) Indiana limestone, Colonial design bank, to Allen Saville, Inc., Electric Bldg. Total est. $500,000. Noted Nov. 20.

OFFICES

PROPOSED WORK

Calif., Los Angeles — State of California, Sacramento, sketches 2 Class A additions to office building. $650,000.

Conn., Hartford—Hartford Steam Boiler Inspection & Insurance Co., Grove and Prospect Sts., 3 story office building, Grove and Prospect Sts. $150,000.

Del., Wilmington—Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., plans by Guilbert & Betelle, 20 Branford Pl., Newark, N. J., 3 story, basement, brick, steel office, plain found. $175,000. Project in abeyance. Noted Feb. 12.

Mass., Chatham—Town, Bd. Selectmen, 2 or 3 story, baseemnt, brick office, Main and Cross Sts. $150,000 or more. Architect not selected.

N. J., East Orange — Baldwin Constr. Co., 614 Central Ave., 2 story, brick, steel office building and stores addition, Central Ave. $175,000. Warren & Warren, 31 Clinton St., Newark, archts. **Maturity about May.** Noted Feb. 19.

Tex., Galveston—Gulf Colorado & Santa Fe R.R. Co., K. B. Duncan, ch. engr., Galveston, soon lets contract 8 and 11 story, 76 x 181 ft., brick, rein.-con., granite, steel, terra cotta additions, plain founds. $1,000,000. E. A. Harrison, c/o owner, archt.

BIDS ASKED

N. J., Jersey City—Springarn Realty Co., J. Springarn, pres., 590 Summit Ave., bids about Apr. 1, general contract 9 story, basement, 100 x 120 ft., brick, steel, rein.-con. office, stores, Newark and Oakland Aves. $750,000. W. Neumann, 26 Journal Sq., archt. and engr. Noted Jan. 22.

CONTRACTS AWARDED

Ore., Eugene—Medical Arts Assn., 12 story, basement, 50 x 100 ft. office, 8th and Williams Sts., to Hargraves & Lindsay, Eugene. Est. $500,000.

STORES

PROPOSED WORK

La., New Orleans—Fiebleman-Sears Roebuck Store, 714 Howard St., soon lets contract 5 story, basement, 100 x 200 ft. store, Baronne and Common Sts. $$300,000.

Mass., Brockton — F. W. Woolworth Co., Park Sq. Bldg., Boston, sketches 3 story, basement, brick store, office, 156-160 Main St. $150,000-$160,000. Private plans.

N. J., Asbury Park — Owner, c/o L. R. Godfrey, archt., Kinmouth Bldg., sketches 2 story, basement, brick, steel store, office, Main St. $150,000.

N. J., Newark—Owner, c/o Bottelli & Bottelli, archts., 45 Branford Pl., sketches 3 story, basement, brick, steel store, loft, plain found., 1014 Broad St. $150,000.

N. J., Orange—C. Messina, 52 North Day St., sketches by Harris & Sohn, 17 Mechanic St., Newark, 3 story, basement, brick, steel store, apartment, 52 North Day St. $150,000.

PUBLIC

PROPOSED WORK

Calif., Los Angeles—COURT HOUSE—Los Angeles Co., election $8,000,000-$10,000,000, Class A court house. Noted Oct. 23.

Idaho, Blackfoot — ASYLUM — State, Boise, plans $250,000 bond issue for asylum buildings.

Mass., Norfolk — DORMITORIES — Commonwealth of Massachusetts, Dpt. Correction, S. Bates, comr., sketches by McLaughlin & Burr, 88 Tremont St., Boston, three 2 story, basement, brick, at State Prison Colony. $150,000

Mass., Springfield — ART MUSEUM — City Library Assn., N. D. Bill, pres., sketches by A. M. Githens & E. T. Tilton, 420 Lexington Ave., New York, art museum, State and Chestnut Sts. $350,000.

Mass., Springfield—MUSEUM—City Library Assn., N. D. Bill, pres., sketches by A. M. Githens & E. T. Tilton, 420 Lexington Ave., New York, natural history museum, State St. $160,000.

Mass., Watertown—ADMINISTRATION, etc. —Town, J. P. Barrett, chn. building com., soon takes bids 2 story, basement, 100 x 100 ft., brick, steel administration building and police station, plain found., Main St. $205,000 appropriated. R. C. Sturgis, 120 Boylston St., Boston, archt. Noted Jan. 8.

N. H., Nashua — LIBRARY — City, Mayor's Office, City Hall, altering and constructing library addition, Clinton St. $150,000. Architect not selected.

N. J., Caldwell — BORO HALL — Bd. Boro Council, Boro Hall, plans by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel, plain found., $200,000. Noted Feb. 5.

N. J., Caldwell—LIBRARY, etc.—Bd. Boro Council, Boro Hall, revised sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel library, civic center, Westfield and Roseland Aves. $200,000. Noted Oct. 30.

N. J., Hillsdale—MEDICAL CENTRE—Dpt. Institutions & Agencies, State Office Bldg., Trenton, 3 story, basement, brick, steel, plain found. $150,000 or more. Project in abeyance. Guilbert & Betelle, 20 Branford Pl., Newark, archts. C. N. Leathem, Jr., State Office Bldg., Trenton, assoc. archt. Noted Jan. 22.

N. J., Keyport — MUNICIPAL — Bd. Town Council, Town Hall, 2 story, basement, brick, steel, Main St. $150,000. **Maturity probably in June.** Architect not selected. Noted Feb. 19.

R. I., Cranston (mail Providence) — REFORMATORY — State, Dpt. P. Welfare, State House, Providence, reformatory. $150,000 or more. Architect not selected.

BIDS ASKED

Ill., Cairo — ARMORY — See "Contracts Awarded."

Ind., South Bend—COURT HOUSE and JAIL —Mar. 30, by Bd. Comrs. St. Joseph Co., F. P. Crowe, aud., remodeling court house and jail. $150,000. Freyermuth & Maurer, South Bend, engrs.

N. J., Bradley Beach—MUNICIPAL—Bd. City Council, 701 Main St., bids about May 1, altering and constructing 2 story, basement, 60x100 ft., brick, steel addition, Main St. and La-Reine Ave. $150,000. K. M. Towner, Kinmouth Bldg., Asbury Park, archt. Noted Jan. 29.

N. J., Hackensack — ADMINISTRATION — Mar. 16, Bd. Freeholders Bergen Co. Court House, Hackensack, tunnels, piling, founds., and 1st floor for 6 story, basement, 200 x 400 ft., brick, steel, rein.-con., plain found., Main and Hudson Sts. Total $1,200,000. E. L. Tilton, F. Schwanewede, & Githens, 420 Lexington Ave., New York, engrs. Noted Feb. 12.

N. J., Jersey City—HALL of RECORDS—Bd. Freeholders Hudson Co. Court House, bids about Apr. 1, 16 story, basement, 200 x 225 ft., brick, steel, adjoining court house. $150,000 or more. J. T. Rowland, Jr., 26 Journal Sq., archt. Noted Feb. 26.

N. Y., Dannemora—PRISON—Apr. 9, by Dpt. Correction, State Office Bldg., Albany, constructing prison steel work for new segregation building, new laundry and bath, also East Cell Block. To exceed $150,000.

N. Y., Kingston — ARMORY — Apr. 16, by State Executive Dpt., Capitol, Albany, armory. To exceed $150,000.

N. Y., Newburgh — ARMORY — Apr. 16, by State Executive Dpt., Capitol, Albany, armory. $150,000 or more.

N. Y., New York—ARMORY—Mar. 11, by Armory Bd., J. Paul, secy., City Hall, administration building, for 369th Infantry at 142nd St. and 5th Ave. Noted Jan. 28.

Plumbing, heating, etc.

CONTRACTS AWARDED

Ill., Cairo—ARMORY—State of Illinois, c/o Dpt. Purchase & Constr., H. Kohn, dir., Springfield, general contract 2 story, concrete, stone, steel armory for Company K, 131st Natl. Guard, to J. Robinson, Anna, $112,967. Owner taking bids Mar. 3, on mechanical work. Noted Jan. 8.

Mass., Newton—COURT HOUSE—Middlesex Co., Court House, East Cambridge, 2 story, basement, brick, stone, steel district court house, plain found., to J. W. Duff, Inc., 146 Summer St., Boston. Est. $150,000. Noted Feb. 5.

N. Y., Poughkeepsie — JAIL — Bd. Supervs. Dutchess Co., general contract jail, North Hamilton St., to L. H. Swenson Co., 2 Cannon St., $249,418; plumbing, to P. C. Doherty Co., 114 Main St., $35,840; heating, to Shaker, Travis & Quinn, 483 Main St., $21,259; electrical work, to H. S. Perry, 46 Manitou Ave., $6,495. Grand total $313,012.

UNCLASSIFIED

PROPOSED WORK

Calif., Los Angeles—LABORATORY—R. K. O. Studios, 780 North Gower St., plans by C. Decker, 780 North Gower St., Spanish type Class A rein.-con. laboratory, Gower and Waring Sts. $500,000.

Tex., San Antonio—COMMUNITY CENTRE—H. C. Thorman, Real Estate Bldg., plans by H. Steinbomer, Real Estate Bldg., community centre, incl. 18 stores, filling station, in 2400 Block Bway. $190,000.

BIDS ASKED

N. Y., New York—STATION FINISH WORK —Mar. 6, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., station finish work for Jay Street-Boro Hall, Bergen and Carroll St. Stations.

CONTRACTS AWARDED

Mass., Holyoke — EXCHANGE — New England Telephone & Telegraph Co., 245 State St., Boston, 3 story, basement, brick, steel, plain found., to J. G. Rox & Sons Co., 21 Silver St., Springfield. Est. $150,000. Noted Jan. 8.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Orange — PRE-COOLING PLANT — Orange-Mutual Citrus Assn., plans by J. V. Vrybaugh, 505 Burch St., Santa Ana, 2 story, 90 x 110 ft., brick, concrete. $80,000.

Const. News page 98

Factories and Mills (Continued)

Calif., Santa Barbara — PLANT — Monticeto Clay Products Co., c/o J. Harnish, Hidden Valley Ranch, Hubbard Rd., sketches roofing tile, brick and floor tile plant on 15 acre site.

Calif., Talmadge—LAUNDRY—State of California plans by C. E. Perry, 417 Sacramento St., Vallejo, fireproof laundry. $60,000.

Mass., Cambridge — MANUFACTURING — Owner, c/o R. T. Jackson, archt., 44 School St., Boston, sketches, 1 story, 60 x 125 ft., brick, concrete. $45,000.

N. J., Morristown—DAIRY PLANT—Bendora Farms, 18 Prospect St., brick, plain found. $40,000. **Maturity probably soon.** Architect not selected.

N. J., Wallington — BAKERY, ETC. — J. Boruta, 103 Halstead St., Wallington, and J. Camlet, archt., 26 Piaget Ave., Clifton, taking new bids general contract 2 story, basement, 75x75 ft., brick, steel, bakery plant, store, garage, Wallington Ave. and Mercer St. $40,000. Noted Feb. 19.

N. Y., Brooklyn—FACTORY—Empire State Bag Co., 760 Wythe Ave., plans by G. Rieger, 451 West 54th St., New York, altering and constructing addition, Penn St. and Wythe Ave $40,000 incl. equipment.

N. Y., Brooklyn—BOTTLING PLANT—F. and M. Schaefer Brewery Co., Kent Ave. and 10th St., plans by Waldemar Martensen, 103 Park Ave., New York, altering and constructing 4 story bottling plant addition. $100,000.

N. Y., Endicott—MANUFACTURING—International Business Machine Corp., Endicott, and 270 Bway., New York, 50 x 56 ft. addition. $150,000. Private plans .

Pa., Conshohocken—L. W. Heiss, archt., West Ave. and Cottman St., soon lets contract 1 or 2 story, brick, steel, plain found., Canal and Bank Sts., for Reilly, Whiteman & Walton Co., Jenkintown.

S. D., Mitchell—CREAMERY—Equity Union Creamery Co., J. Hammer, mgr., plans by F. W. Kings, Mitchell, 1 story, basement, 75 x 92 ft., rein.-con., brick. $65,000.

Tex., Eagle Lake—ICE PLANT, etc.—Central Power & Light Co., Natl. Bank of Commerce Bldg., San Antonio, improvements to ice plant and cold storage rooms. Private plans.

Tex., El Paso — DRY ICE PLANT — J. O. Hamilton, et al., Las Cruces, N. M., dry ice plant. $50,000. Private plans.

Tex., Longview—OIL REFINERY—Southern Oil Refining Co., El Dorado, Ark., sketches refinery plant. $125,000. Private plans.

Tex., Longview—REFINERY—F. Buford & E. W. Griswold, Tulsa, Okla., sketches oil refinery plant, near here. $100,000.

Tex., Rio Grande City—ICE PLANT—Central Power & Light Co., Natl. Bank of Commerce Bldg., San Antonio, 1 story, 45 ton ice plant. $40,000. Private plans.

Ont., Thorold—PAPER MILL—See "Contracts Awarded."

BIDS ASKED

Mass., Stockbridge—WOODWORKING PLANT —See "Contracts Awarded."

N. J., Beach Haven — GAS PLANT — See "Contracts Awarded."

N. Ja Montclair—FACTORY—See "Contracts Awarded."

N. J., Newark — PAINT PLANT — Grasselli Chemical Co., Inc., 256 Liverpool Pl., taking bids general contract altering and constructing 2 story, basement, brick, steel addition, Vanderpool St. $40,000. Private plans.

N. J., New Brunswick—BAKERY—Owner, c/o H. G. Bach, archt., 63 Schureman St., bids about Mar. 2, general contract 2 story, basement, brick, steel, Livingston Ave. $40,000. Noted Feb. 26.

N. Y., Sonyea—BAKERY—Mar. 25, by Dpt. Mental Hygiene, State Office Bldg., Albany, bakery at Craig Colony for Epileptics. To exceed $40,000.

O., Ashland—PUBLISHING PLANT—Ashland Times Gazette Co., Ashland, taking bids 1 story, basement, 40 x 100 ft., brick, rein-con. publishing plant. $40,000. Dickerson & Rhoades, Sloan Bldg., Cleveland, archt. Noted Feb. 5.

Pa., Bradford — BOTTLING PLANT — Coca Cola Bottling Wks., M. Gleitsman, mgr., 20 Roberts St., taking bids 1 and 2 story, basement, 75 x 100 ft., brick, stucco. Private plans.

Wash., Vancouver—CANNING PLANT—Sutton & Whitney, archts., Lewis Bldg., Portland, Ore., bids about Mar. 15, 1 story, 80 x 370 ft. and 100 x 100 ft. cannery and cold storage plant, for Washington Canners Co-Operative Assn. $75,000.

CONTRACTS AWARDED

Calif., Tustin — PRE-COOLING PLANT — Tustin Hills Citrus Assn., Class A, rein.-con. pre-cooling plant, to J. W. Markel & Sons, Builders Exch. Bldg., Santa Ana., $90,000; pre-cooling system, to York Ice Mchy. Corp., 5051 Santa Fe Ave., Los Angeles.

Calif., Santa Paula — PACKING PLANT — Mupu Citric Assn., rein.-con. steel, to Richards-Neustadt Constr. Co., W. M. Garland Bldg., Los Angeles, $52,995.

Ga., Austell—THREAD MILL—J. E. Sirrine & Co., archts. and engrs., Greenville, S. C., 3 story, 133 x 498 ft., brick, steel main building 2 story, 50 x 100 ft. brick, timber opener room, 2 story, 100 x 150 ft. brick warehouse, 1 story, 30 x 45 ft. brick boiler house, 500,000 gal. rein.-con. reservoir, near here, to A. K. Adams & Co., 542 Plum St. N. W., Atlanta, for Clark Thread Co., W. H. Lostus, 260 Ogden St., Newark, N. J. Est. $2,000,000. Noted Jan. 29.

Ind., Indianapolis—PLANT—W. J. Holliday & Co., 545 West McCarty St., brick, steel plant, Missouri and Georgia Sts., to Brown & Mick, 1020 East Michigan St. Est. $40,000.

Mass., Stockbridge—WOODWORKING PLANT —D. D. Hopkins Lumber Co., South Lee, rebuilding 1 story, 60 x 160 ft., concrete, day labor. Private plans.

N. J., Bound Brook—TARVIA PLANT—Barrett Co., River Rd., Edgewater, general contract 1 story, brick, steel, Chimney Rock Rd., to Millburn Mchy. Co., Chimney Rock Rd. Est. $40,000.

N. J., Beach Haven—GAS PLANT—Jersey Central Power & Light Co., Toms River, 1 story, basement process building, storage tanks, for butain gas plant, Brighton Beach, separate contracts. $40,000. Private plans.

N. J., Montclair—FACTORY—G. H. Nash, 44 Walnut Crescent, 1 story, basement, brick, steel, plain found., 103-07 Grove St., separate contracts. $40,000. Private plans.

Pa., Pittsburgh—DAIRY—Corliss Creamery Co., c/o N. L. and T. H. Sappie, 1762 West Carson St., 2 story, basement, 98 x 160 ft., rein.-con., brick, concrete, 1228 Reedsdale St., to Schutz, Schreiner & Clyde, May Bldg.

Pa., Pittsburgh — PRINTING PLANT — Herbick & Held Co., 1117 Wolfendale St, N. S., concrete, steel, brick, 1117 Wolfendale St., to Austin Co., Union Trust Bldg. Est. $50,000.

Tex., Beaumont—BOTTLING PLANT—Coca-Cola Bottling Co., c/o J. M. Acker, mgr., 2 story, 70 x 160 ft., brick, rein.-con., bottling plant, plain found. $150,000. Day labor. Pringle & Smith, Norris Bldg., Atlanta, Ga., archts.

Newfoundland—MILL—American Smelting & Refining Co., 120 Bway., New York, doubling mill capacity, incl. smelter plant, Red Indian Lake, day labor and separate contracts. $500,000. **Maturity indefinite.** Noted Mar. 20.

Ont., Thorold—PAPER MILL—Ontario Paper Co., A. Schom, mgr. (controlled by Chicago Tribune, 435 North Michigan Ave., Chicago, Ill.), mill, incl. new equipment, day labor. $250,000.

Que., Valley Junction—MAPLE SUGAR REFINERY — Les Producteurs de Sucre d'Erable de Quebec, 5, Begin Ave., Levis, C. Vaillancourt, secy., general contract 5 story, 60 x 240 ft., brick, rein-con. to J. Baily, St. Georges deBeauce. Est. $105,000.

GARAGES

BIDS ASKED

Conn., Bridgeport—Dugan Bros., Inc., Glenwood Ave., taking bids general contract 1 story, 60 x 200 ft., brick, steel service building, Boston Ave. $50,000. Fletcher Thompson, Inc., 1336 Fairfield Ave., archts. H. Holder, 252 Franklin Ave., Brooklyn, N. Y., engr. Noted Jan. 22.

Mass., Fall River—See "Contracts Awarded."

R. I., Pawtucket—Frank Cook, Inc., 103 Exchange St., taking bids 1 story, brick, rein.-con., steel sales and service garage, plain found., North Main St. $50,000. A. Addeo, 117 Bway., Providence, archt. Noted Jan. 22.

CONTRACTS AWARDED

Conn., Bridgeport—Goodrich Silvertown, Inc., 386 Fairfield Ave., 2 story, 30 x 130 ft. and 26 x 50 ft., brick, steel, tile, stucco, super tire service plant, to W. J. Shaughnessy, Jr., Inc., 555 Grant St. Est. $60,000. Noted Jan. 15.

Mass., Fall River—Pilgrim Leasehold Co., 44 School St., Boston, 2 story, 65 x 160 ft., brick, steel garage and stockroom, concrete found., east side of 9th St., separate contracts. $45,000. Private plans. Noted Feb. 12.

N. J., Clifton — H. Holder, archt., 242 Franklin Ave., Brooklyn, N. Y., general contract 1 story, 200 x 235 ft., brick, steel, rein.-con. garage, stable, to Wilcox Constr. Co., Inc., 1 Bridge Plaza, Long Island City, for Dugan Bros., Inc., 161 Arlington Ave., Newark. Est. $150,000. Noted Feb. 19.

SHOPS AND FOUNDRIES

PROPOSED WORK

Conn., Cheshire—SHOP—State, Connecticut Reformatory, shop to manufacture markers. $40,000. Architect not selected.

N. Y., Brooklyn — AUTOMOBILE PAINT SHOP — Owner, c/o J. E. Henry Co., Inc., 189 Montague St., automobile paint shop, Pacific St. and Underhill Ave. $40,000.

N. Y., New York—SHOP—Consolidated Gas Co., 4 Irving Pl., soon lets general contract 3 story shop, 500 East 63rd St. $350,000. J. F. Hunter, c/o owner, archt. Noted Feb. 19.

Pa., Erie—MACHINE SHOP—Erie Fdry Co., D. W. McDonald, secy., A. Reed, in charge constr., 1253 West 12th St., 1 story, brick, steel, West 12th St. $40,000. **Maturity about June 1.** Architect not selected.

BIDS ASKED

Calif., Los Angeles—WELDING SHOPS—See "Contracts Awarded."

N. Y., New York—SHOP—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Los Angeles—WELDING SHOPS—Consolidated Steel Corp., 1200 North Main St., 1 story, 120 x 750 ft., steel, corrugated iron, Slauson Ave., own forces. Private plans.

N. Y., New York — SHOP — Ranco Realty Corp., 100 x 100 ft. shop, Tiffany St. and East Bay Ave., separate contracts. $40,000. N. Rotholz, 155 East 42nd St., archt. Noted Feb. 19.

POWER PLANTS

PROPOSED WORK

Ky., Harlan—City new complete power plant, Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

N. J., Perth Amboy—Bd. City Comrs., City Hall, brick, steel electric light plant addition. $40,000. **Maturity probably in May.** Architect not selected. Noted Jan. 29.

Ore., Portland—City Council retained Carey & Harlan, industrial engrs., Failing Bldg., to make power survey covering report on preliminary estimated costs and availability and capacity of power sites in vicinity. $25,000.

S. C., Aiken—City soon takes bids installing Diesel oil engine at light and power plant, Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs. Noted Nov. 6.

BIDS ASKED

Calif., Pasadena—Mar. 16, by City Directors, 25,000 kw. steam turbine electric generator unit for municipal power plant. $400,000.

Okla., Hominy—City, G. H. Blackwood, clk., bids about Apr. 1, brick, concrete power plant, equipment. $150,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma City, engrs.

CONTRACTS AWARDED

Calif., Long Beach—Southern California Edison Co., 306 West 3rd St., Los Angeles, 3rd unit, 110 ft. high, 150 x 267 ft., 135,000 hp. additional stea mheating unit, steel, concrete, incl. two 262 ft. chimney stacks, to Stone & Webster, 510 Homer Laughlin Bldg., Los Angeles, $7,500,000. Noted Jan. 29.

La., Opelousas — City Council, furnishing, supervising installation 950 to 1,000 hp. engine, incl. motor operation generator, exciter, to Busch Sulzer Bros. Diesel Engine Co., Opelousas, $48,990.

Mass., East Longmeadow — Central Massachusetts Electric Co., 406 Main St., Palmer, 1 story, brick, steel, concrete power station, automatic operation. $50,000 with equipment. Owner builds. Private plans.

Pa., Phila.—Philadelphia Electric Co., 10th and Chestnut Sts., 1 story, 95 x 170 ft., brick, steel power plant, plain found., Tabor and Adams Sts., to United Engineers & Constr. Co., 112 North Broad St., $103,000.

WAREHOUSES

PROPOSED WORK

Conn., Greenwich—Doran Bros., 29 Railroad Ave., soon lets contract 2 story, 52 x 154 ft., brick, concrete storage warehouse, Railroad Ave., $55,000. G. S. Kinsley, 103 East 125th St., New York, archt.

Pa., Breckenridge—Standard Oil Co. of Pennsylvania, Peoples Gas Bldg., Pittsburgh, c/o W. Black, in charge, sketches bulk plant, river and rail facilities, on Flaccus Glass Property, near here.

Tex., El Paso—Gulf Colorado & Santa Fe R.R., K. B. Duncan, ch. engr., Galveston, 70 x 160 ft., rein.-con., brick freight office, warehouse, concrete pile found. $125,000-$150,000.

BIDS ASKED

N. Y., Bedford Hills—Mar. 26, by Dpt. Correction, State Office Bldg., Albany, cold storage, bakery, employees home, laundry building, store house, at New York State Reformatory for Women. To exceed $40,000.

N. Y., West Haverstraw—Apr. 16, by Dpt. Standards & Purchase, State Office Bldg., Albany, storehouse, dining room, kitchen and laundry, at New York Orthopedic Hospital. To exceed $100,000.

Pa., Phila.—M. W. Easby, Inc., engrs., 1505 Race St., taking bids separate contracts 2 story, 100x200 ft., rein.-con., brick, steel warehouses, plain found., Frankford and Richmond Sts., for Ajax Metal Co., 46 Richmond St.

CONTRACTS AWARDED

Mass., Franklin—A. Simon & Sons, Main St., 2 story, brick, steel warehouse, concrete found., to R. H. Sewell Co., East Central St. Est. $40,000.

See proposal advertising on page 150

Const. News page 99

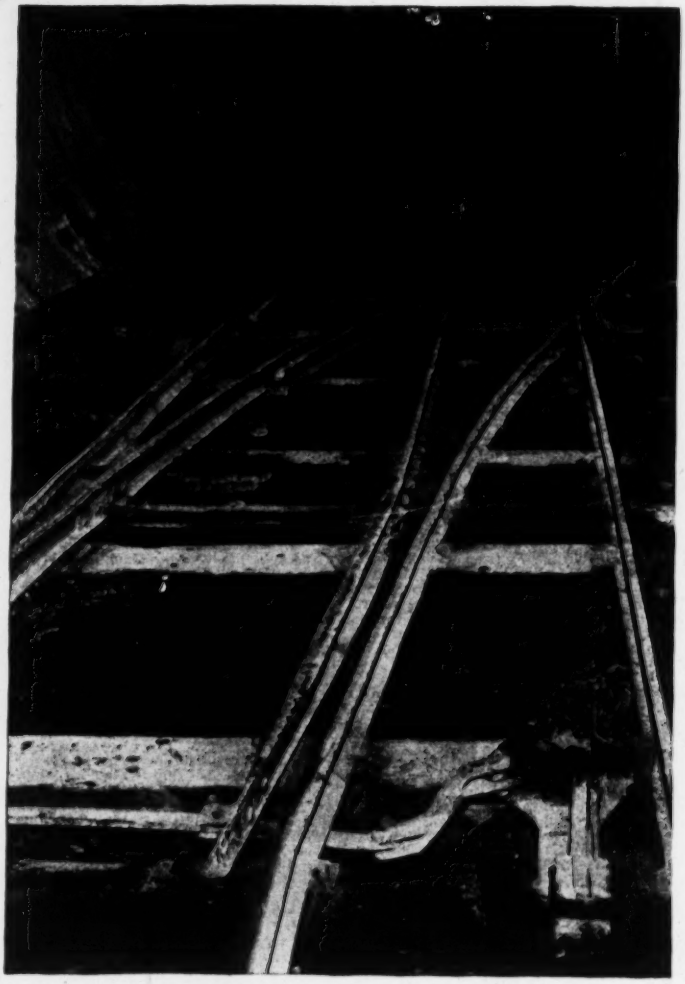
A low, safe, dependable stand for confined locations

Bethlehem Model 1217 Switch Stand has only three moving parts: the crank lug, the sliding block, and the throwing lever.

IN tunnel, bridge and industrial construction where the space available for material haulage track is often restricted, the Bethlehem Model 1217 Switch Stand is thoroughly suitable. The low construction of the stand particularly adapts it to confined locations, where it offers greater safety to the operator and to the traffic. This stand is easily and quickly operated and has a throw parallel to the track. The weighted throwing lever holds the switch points securely against the stock rails.

The Bethlehem Parallel Throw Switch Stand Model 1217 is an extra-low, easily-operated stand for use by contractors and industrial plants. This stand can be used with all weights of rail from 12 to 60 lbs., and is equipped with a forged-steel, adjustable, screw-eye crank, providing full adjustment for any required throw of the switch from 2½ in. to 5 in.

There are only three moving parts—the throwing lever, the crank and the sliding block—and they are all located on top of the stand where they are easily accessible. The sliding block has unusually long life; should it become worn after long service, it can be quickly restored by a one-quarter turn, which brings two new, full-size wearing surfaces into play.



Bethlehem Model 1217 Switch Stand installed at a crossover of temporary haulage track in subway.

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BETHLEHEM
Model 1217 Switch Stand